Alberta
EDUCATION

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To the Reader:

The accompanying report entitled Implementing Computer Technology in School Systems is an outcome of a study initiated by the County of Grande Prairie #1. It will be of interest not only to County of Grande Prairie residents but also to persons planning the introduction of computer technology in other school systems. We are pleased to be able to make this publication available for use by those who will find the topic pertinent.

Sincerely,

H Hastings

H.I. Hastings
Director
Planning Services

IMPLEMENTING COMPUTER TECHNOLOGY
IN SCHOOL SYSTEMS

A Study Conducted
by

Richard Gilchrist and Hugh A. Sanders

on behalf of
The Board of Education of the County of Grand Prairie No. 1
and
Alberta Education

June 1983

ABSTRACT

This report deals with the implementation of computer technology in small school systems, particularly in the County of Grande Prairie No. 1.

The researchers analyzed responses to two questionnaires, one to all school superintendents in Alberta and one to all teachers in the County of Grande Prairie No. 1. The provincial survey addressed types of teacher inservice education models and current strategies for implementing computer technology, while the county survey determined the level of interest in computers and the knowledge and experiences of county staff. The researchers also visited six school systems in Alberta.

This report discusses a model for the implementation of computer technology in school systems and makes eleven policy recommendations for the County of Grande Prairie. As well, the report suggests several implementation strategies that reflect the policy recommendations. These strategies deal with plans for purchasing computers, placing computers in schools, inservice education needs for teachers, and a list of priorities for the use of computers in schools. Finally, the report suggests evaluation criteria for the computer implementation project in the County of Grande Prairie.

IMPLEMENTING COMPUTER TECHNOLOGY IN SCHOOL SYSTEMS

SUMMARY

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IMPLEMENTING COMPUTER TECHNOLOGY IN SCHOOL SYSTEMS

SUMMARY

Origins of the Study

This study was developed at the request of the County of Grande Prairie No. 1 in April 1982. Since the county had not yet implemented computer technology in its schools and was facing rising pressure to do so, it requested that a coordinated plan be developed. As the County of Grande Prairie school system is fairly typical of many systems in the province, Planning Services of Alberta Education supported the project and requested that some general guidelines for implementing computer technology be developed.

Purpose of the Study

The two major purposes of the study were:

1. To develop a range of alternative plans for the introduction of computer technology into the schools of the County of Grande Prairie.
2. To develop a general model for the development of computer technology implementation strategies which would be applicable to any small school system.

Study Objectives. In attempting to fulfill the purposes of the study, the following objectives were established:

1. To assess the instructional uses of computers in schools.
2. To assess the non-instructional uses of computers in schools and school systems.
3. To explore computer implementation strategies employed by school systems.
4. To assess the technology available to a small school system.

5. To determine present knowledge and expertise among personnel in the County of Grande Prairie.
6. To determine the extent and availability of human and physical resources outside the County of Grande Prairie.
7. To analyze current implementation strategies in terms of their application to the county of Grande Prairie.
8. To develop alternative implementation strategies for use by small school systems.
9. To present the implications of each alternative with regard to physical and human resource needs.
10. To make recommendations as to the most suitable alternative for the County of Grande Prairie.
11. To produce a handbook of planning guidelines, for implementing computer technology in school systems, indicating do's and don't's.
12. To develop a plan for evaluating the effectiveness of the implementation of computer technology in the County of Grande Prairie schools.
13. To present a final report to the Board of Education not later than June 1983.

Data Collection

Several strategies were used to attempt to meet the study objectives. The researchers identified data sources and then developed two questionnaire surveys, one for Alberta school superintendents and the second for the County of Grande Prairie teaching staff.

The survey of Alberta school superintendents was intended to collect data on how school systems in the province of Alberta were coping with implementing computer technology in the schools. It was designed to gather information about:

a) school board policies concerning the implementation of computer technology in schools,
b) computer hardware and software distribution and usage, and
c) coordinating the implementation process and developing system expertise.

Of the 110 systems surveyed, 93 responded for an 85% return.

The survey questionnaire of County of Grande Prairie staff was intended:

a) to determine the level of expertise in the use of computers among county staff members, and
b) to determine the level of willingness of staff to become involved with the use of computers in the school.

The survey was distributed to all school-based professional staff. Of 187 surveys sent out, 155 were completed for an 85% return.

In addition the researchers visited six school systems in the province to examine their computer technology implementation strategies.

As a third strategy, review of the literature was conducted to gather information on computers and their use in schools and school systems.

Findings

The following major finding of the study are summarized below.

1. Survey of Alberta School Superintendents

    a) The extent of computer technology implementation in the province is rather limited. Little attention has been paid to the development of specific school board level policies in this area.
    b) In the distribution of computer hardware, the Apple format microcomputers have become a standard for use in Alberta schools, with some use of Commodore computers. Other formats are not present in significant numbers.
    c) Implementation of computer technology in schools has proceeded to a much greater extent at the senior high school level than at the elementary and junior high school levels.
    d) The major thrust of programs for the province is the development of computer literacy. Applications of computer technology are most advanced at the high school level, especially in the areas of business education and vocational education.

e) Where inservice programs have been developed, the tendency has been to utilize local resource leaders.
f) About 60% of the school systems responding indicated that they have central coordination of computer technology implementation programs.
g) Thirty percent of the respondents indicated that computers had not yet been introduced to schools in the system.

2. Survey of County of Grande Prairie Staff

a) The level of professional training of staff in the area of computer technology is low.
b) Interest among staff in the implementation of computer technology in classrooms is high.
c) Willingness to develop personal expertise in computer technology among staff is high.
d) One-fifth of the respondents indicated a willingness to take a leadership role in the school.
e) In general, secondary school teachers have a higher level of training and exposure to computer technology than do elementary teachers.
f) Approximately ten percent of respondents were identified as being possibly resistant to computer technology in schools.

3. School System Visits.

a) An inservice program for teachers which is synchronized with the implementation of system hardware and software is important.
b) Central coordination is important to the success of the implementation process.
c) Those teachers within the school who have developed expertise and are willing to act as resource persons for that school play a key role.

Implementation Strategy Development

The study findings indicated that an effective implementation plan would have the following major features:

1. Clearly established system level goals,
2. A school board policy for the use of computers,
3. Provision for central coordination of the implementation process,
4. Provision for the development of expertise among the staff, coordinated within the framework of hardware and software purchasing and placement, and

5. Provision for the development of new uses for computer technology as the level of expertise among staff and computer literacy among students is developed.

On the basis of these features, many strategies for implementing computer technology were explored and those best suited to the needs of the County of Grande Prairie were identified.

Recommendations

Two classes of recommendations were made. The first set of recommendations are general statements applicable to many school systems, while the second set applies specifically to the County of Grande Prairie.

1. When implementing a computer plan into a school system, it is recommended that:
1.1. A school system adopt a set of goals for the use of computers in its schools.
1.2. A school system designate an individual to assume responsibility for the coordination of the implementation process.
1.3. A school system provide for the centralized purchase and control of hardware in order to plan for the effective use of limited hardware during the initial phasing in of computers.
1.4. A school system provide for the centralized purchase and control of software for the system.
1.5. A school system establish an implementation committee with representation from each school in the jurisdiction.
1.6. A school system provide for teacher inservice activities related to the use of computers.
1.7. A school system encourage teachers to enroll in computer courses, and participate in inservice activities of interest to them.
1.8. A school system encourage teachers to use computers as a tool to assist them in reaching the goals of education.
1.9. A school system adopt a standard computer model for use in the schools to ease the inservice requirements of implementation. Alternative models of computers could be purchased after the initial introduction of computers to schools.
2. For the implementation of a microcomputer plan into the County of Grande Prairie, it is recommended that:

2.1. The Board of Education approve the following goal statement: "The Board of Education will initiate a program for the use of computers for instruction in the schools of the County of Grande Prairie."

2.2. The following table of priorities be adopted:

Uses of Computer Technology With Priority Rating
and Implementation Schedule

Use	Division	Priority	Recommended Implementation
Computer Literacy Curriculum	II III IV	High	Sept. 83 - Feb. 84
General Computer Awareness	I	High	Feb. 84 - Sept. 84
Computer Assisted Instruction	I II	Moderate	Feb. 84
Computer Managed Instruction	II III	Moderate	Feb. 84 - Sept. 84
Computer Assisted Instruction in Special Education	I II III	High	Feb. 84
Computer Science Sources	III	Moderate	Sept. 84 - Feb. 85
	IV	High	Sept. 83 - Feb. 84
Business Education Applications	IV	High	Already Implemented
Industrial Education	III IV	Low	
School Administration	I II III IV	Low	

2.3 The Board of Education approve the following policy statements:

2.3.1. The Board of Education supports the introduction of computers into the schools of the County through a centrally coordinated implementation program.

2.3.2. The Board of Education supports the concept of the availability of computer technology to instruction at all grade levels.

2.3.3. The Board of Education supports the introduction of microcomputers into the existing resource room programs throughout the County.

2.3.4. The Board of Education supports the development of a teacher inservice program.

2.3.5.1. The Board of Education supports the development of student computer literacy.

2.3.5.2. The Board of Education supports the implementation of the Alberta Computer Literacy curriculum at the earliest opportunity.

2.3.6. The board of Education supports and encourages the use of computers for the management of student classroom instruction.

2.3.7. The Board of Education supports the computer applications presently in place and their continued development.

2.3.8. The first priority of the Board of Education is that computers be used for instructional purposes.

2.3.9. The Board of Education supports the use of microcomputers in school administration.

2.4. The Board of Education hire a part-time coordinator for the computer implementation project.

2.5. The Board of Education create a committee of school resource teachers which has representation from each school and provide four half-day inservice sessions on computers early in September 1983.

2.6. The Board of Education offer computer literacy and computer processing courses in Sexsmith Secondary School during Semester I, 1983-84 and in Beaverlodge Regional High School in February 1984 or September 1984.

2.7. The Board of Education establish computer literacy courses for classroom teachers during the first half of the 1983-84 school year in the centers of Sexsmith and Hythe.

2.8. The Board of Education offer computer literacy courses in Divisions II and III dring the 1983-84 school year.

2.9. The Board of Education pay tuition expenses for school resource teachers taking university credit courses in the area of microcomputers.

2.10. The Board of Education work toward the purchase and distribution of software through a centrally coordinated office. This could be a function of a media centre if one is contemplated in the future.

2.11. The Board of Education adopt a plan for the evaluation of the implementation of the microcomputer plan into the County of Grande Prairie.

2.12. The Board of Education purchase additional Apple II computers according to the following plan:

Purchase Plan

School	Computers Present Apple Format	Computers Purchase Sept. 1983	Computers Purchase Feb. 1984	Printers Present	Printers Proposed 1983	Printers Proposed 1984	Cost ($) 1983	Cost ($) 1984
Beaverlodge Elementary	-	1	3	-	1	-	2850	6000
Beaverlodge Regional H.S.	1	3	6	1	-	1	6000	12850
Bezanson	-	1	-	-	-	-	2000	-
Elmworth	-	1	-	-	-	-	2000	-
Harry Balfour	1	1	5	-	1	-	2850	10000
Hythe Elementary	2	1	1	-	1	-	2850	2000
Hythe Regional J.H.S.	2	1	4	-	1	-	2850	8000
LaGlace	-	1	-	-	-	-	2000	-
Sexsmith Elementary	1	1	2	-	1	-	2850	4000
Sexsmith Secondary	4	1	6	2	-	-	2000	12000
Teepee Creek	1	1	-	-	-	-	2000	-
Vahalla	-	1	-	-	-	-	2000	-
Wembley	3	1	3	-	1	-	2850	6000
Grandview Colony*	-	-	-	-	-	-	-	-
County (Central Resource)	-	5	-	-	-	-	11700	-
Total	15	20	30	3	6	1	46800	60850

* Provision for the placement of a microcomputer in the Grandview Colony school would be subject to negotiations with the Colony leader.

ACKNOWLEDGEMENTS

The research team wishes to acknowledge the support and assistance of all school systems whose personnel participated in the study. In particular we wish to express our thanks to those who took time to show us around the schools in their system. Their interest in the project was very gratifying and their assistance was invaluable.

Special thanks also go out to Mrs. Rose Shmyruk, the secretary at Sexsmith Secondary School, Lisa Perreault and Linda Radcliffe for the many hours of typing services she provided; and to Shelly Sorken and Paula Moody, high school students at Sexsmith to whom the burden of tabulating survey returns and responses fell.

To Lawrence Beaudry, Superintendent of Schools for the County of Grande Prairie No. 1, our thanks for the invaluable assistance he provided throughout the project. To Mrs. Yula Romanko, school trustee for the County of Grande Prairie No. 1, a special thank you for her enthusiasm and her ability to keep the project focused on the children who are the recipients. Mr. Beaudry and Mrs. Romanko, along with Dr. Harry Sherk of Alberta Education, made up the steering committee. The contribution of that committee was greatly appreciated.

The project was funded jointly by the County of Grande Prairie No. 1 and the Planning Service Branch of Alberta Education. The researchers appreciate the support granted by those agencies.

Finally the role played by Drs. Craig Montgomerie and Don Richards of the University of Alberta, Department of Educational Administration, is acknowledged. Drs. Montgomerie and Richards acted as advisors to the project team. Their initial encouragement and advice led to the undertaking of this project.

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CHAPTER 1

CONDUCTING THE STUDY

This chapter presents an overview of the study, which includes the development of a rationale for conducting this study as well as a statement of the study problem and discussion of the methodology employed in the planning, the design of the data collection framework and reporting aspects.

Background and Rationale

The recent explosion of information technology, as a result of the development of the microprocessor chip, has thrown some new challenges out to the educational establishment. In a scant few years the computer has been transformed from a mystical beast to an indispensable tool for modern living.

School systems have never before been faced with such a pervasive technology, which is being developed with such speed. The consumer has become the industry's target, and schools are struggling to adjust to the rapidly changing environment. The juggernaut of microcomputer technology is sweeping all before it and education must learn to adapt. We now see the phenomena of computers in the home before they are in the school. To some extent the traditional role of the school, in exposing students to technology and guiding them through it, has been usurped by our ravenous free enterprise, market economy.

Until now, the traditional time lag between invention and implementation has protected educators from too-rapid change. But now the basic inertia of our educational philosophy is being challenged. No longer do educators have two or three decades to evaluate, refine and apply new technologies. As a result, there has been somewhat of a wild scramble to catch up with the times and sometimes an hysterical dash to get the schools computerized.

The pressure to implement a program for the use of computer technology in schools has risen very rapidly, leading to a very unorganized approach to the development of educational applications for computers. This study is an attempt to put forward a more rational and better planned implementation process.

The proposal for this study was developed as a result of a request by the Board of Education of the County of Grande Prairie No. 1 for the development of a rational, planned approach to the implementation of computer technology in the school system. As this was also a high priority for the Planning Services Branch of Alberta Education, the Branch agreed to partially fund the study.

Statement of Purpose

The study had two major purposes:

1. To develop a range of alternative plans for the introduction of computer technology into the schools of the County of Grande Prairie.
2. To develop a general model for the development of computer technology implementation strategies which would be applicable to any small school system.

Study Objectives. In attempting to fulfill the purposes of the study, the following objectives were established:

1. To assess the instructional uses of computers in schools.
2. To assess the non-instructional uses of computers in schools and school systems.

3. To explore computer implementation strategies employed by school systems.
4. To assess the technology available to a small school system.
5. To determine knowledge and expertise among personnel in the County of Grande Prairie.
6. To determine the extent and availability of human and physical resources outside the County of Grande Prairie.
7. To analyze current implementation strategies in terms of their application to the County of Grande Prairie.
8. To develop alternative implementation strategies for use by small school systems.
9. To present the implications of each alternative with regard to physical and human resource needs.
10. To make recommendations as to the most suitable alternative for the County of Grande Prairie.
11. To produce a handbook of planning guidelines for implementing computer technology in school systems, indicating do's and don't's.
12. To develop a plan for evaluating the effectiveness of the implementation of computer technology in the County of Grande Prairie schools.
13. To present a final report to the Board of Education not later than June 1983.

These objectives provided a framework for collecting and analyzing data and designing a format for reporting the outcome of the project.

Design of the Study

As the intent of the study was to develop suitable strategies for implementing computer technology, certain basic questions needed researching. In particular these questions were deemed crucial: "Do successful implementation strategies already exist?" and "What is the level of preparedness for the new technology within the school system?"

The remainder of this chapter outlines how the project was designed and organized to achieve the study purposes.

Study Phases. The study was conducted in these four separate though overlapping phases:

1. Project Design
2. Data Collection
3. Data Analysis and Strategy Identification
4. Reporting

A timeline for the completion of the study was developed (CHART 1.1). Each phase was viewed as consisting of a sequence of significant events, leading to the completion of the project (TABLE 1.1). Prior to the beginning of the project, during the proposal stage, Program Evaluation and Review Techniques (PERT) were used to develop an overall management scheme.

Data Collection Framework

In seeking to identify and evaluate current implementation strategies and to design new ones, the researchers had to establish a means of collecting relevant data. A first step was to identify the type and sources of data required and then develop the necessary instruments. (TABLE 1.2 summarizes the types of data identified as being pertinent to the study, as well as the relevant data sources and methods for data collection.)

It was decided that data on current implementation strategies and on the skills and resources available among the County of Grande Prairie teaching staff could best be the collected through a combination of survey questionnaires and follow-up visits. The majority of the data collection therefore centred around two survey instruments, one directed to each

CHART 1.1

Timeline For Project Phases

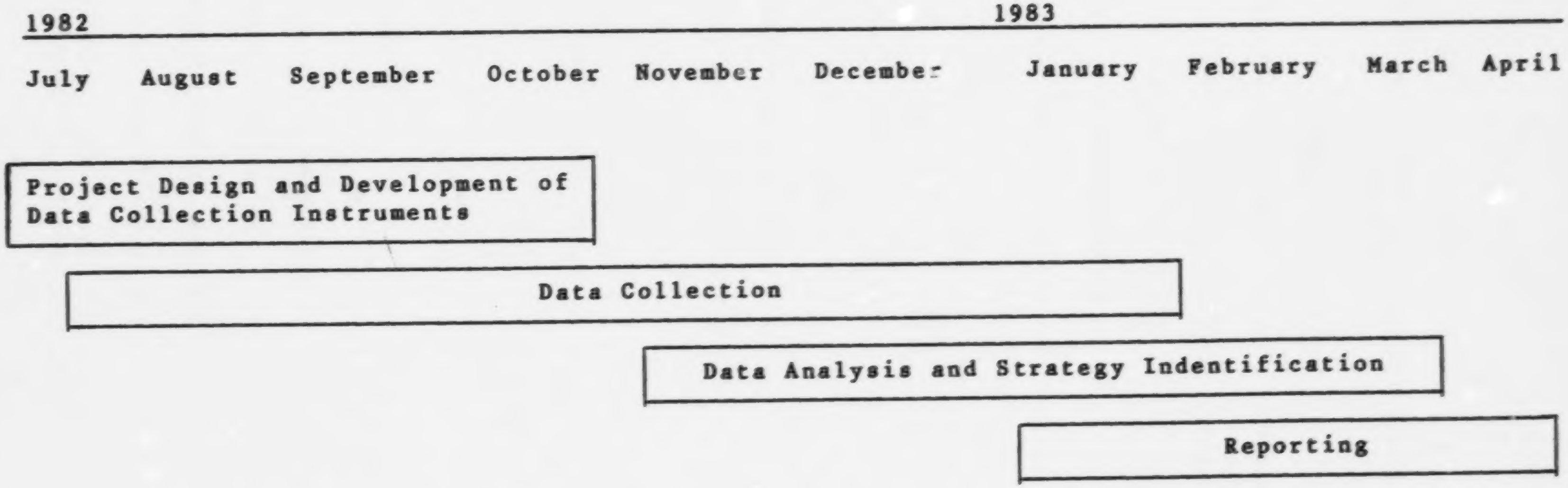


TABLE 1.1

Significant Events for Completion of Project

Phase		Event
1. Project Design and Development of Data Collection Instruments	1.1	Project design completed
	1.2	Types and sources of data identified
	1.3	Data Collection instruments designed
	1.4	Data collection framework established
	1.5	Field testing and revision of data collection instruments completed
	1.6	Reporting system designed
	1.7	Steering committee established
2. Data Collection	2.1	Literature survey started
	2.2	Data collection instrument distributed
	2.3	Data collection instruments returned
	2.4	School systems for case studies identified
	2.5	Inventory of county's present human and physical resources completed
	2.6	Literature search completed
	2.7	Visits to case study school systems completed
	2.8	All data collection completed
3. Data Analysis and Strategy Identification	3.1	Data analysis started
	3.2	Data analysis framework completed
	3.3	Data analysis completed
	3.4	Criteria for issue generation identified
	3.5	Procedures for developing implementation strategies identified

	3.6 Issues identified
	3.7 Current implementation strategies identified
	3.8 Strategy development completed
	3.9 Evaluation of strategies completed
	3.10 Human resource development programs identified
	3.11 Additional physical resource requirements identified
	3.12 Strategies for recommendation selected
	3.13 Cost implications for selected strategies determined
4. Reporting	4.1 Steering committee advised of recommendations
	4.2 Review of recommendations completed
	4.3 Final report format established
	4.4 Draft report prepared
	4.5 Draft report presented to steering committee
	4.6 Final report completed
	4.7 Final report presented to Board of Education and Alberta Education
	4.8 Project completed

TABLE 1.2

Data Identification and Collection Scheme

	Data Required	Source Identity	Collection Method
1.	Instructional Uses of Computers in Schools		
	a) Presently in Alberta	Superintendents	Survey questionnaire Visits to school systems
	b) Possible uses	Research reports, papers and general literature	Literature survey
2.	Non-Instructional Uses of Computers in Schools		
	a) Presently in Alberta	Superintendents	Survey questionnaire Visits to school systems
	b) Possible uses	Research reports papers and general literature	Literature survey
3.	Current Computer technology Implementation Policies	Superintendents General Literature	Survey questionnaire Visits to school systems Literature survey
4.	Distribution of Computer Hardware and Software	Superintendents	Survey questionnaire
5.	Existing Teacher Inservice Programs	Superintendents General Literature	Survey questionnaire Visits to school systems Literature survey
6.	Training of County Staff in the Use of Computers		
	a) Formal	County staff	Survey questionnaire
	b) Informal	County staff	Survey questionnaire
7.	Interest of County Staff in the use of Computers	County staff	Survey questionnaire

school superintendent in Alberta and a second distributed among county staff. In both cases the survey populations were the total group, that is, all school superintendents in Alberta and all teachers in the jurisdiction.

Design of Data Collection Instruments. As the types of data required from the different survey populations were unrelated, two separate instruments were developed.

The survey questionnaire of Alberta school superintendents was intended to collect data to support study objectives 1, 2, and 3. The questionnaire was divided into three sections which dealt with:

a) school board policies concerning the implementation of computer technology in schools,
b) computer hardware and software distribution and usage, and
c) the implementation process and developing system expertise

Respondents were also offered the opportunity to comment on their experiences with the implementation process within their school system.

A second purpose of the survey was to identify school systems for further study by follow-up visit and interviews with system personnel.

The survey instrument was designed for ease of response; most questions required a checkmark response. Although addressed to system superintendents, it was recognized that some other officer might have responsiblity in this area and provision was made for the questionnaire to be completed by a designate of the superintendent.

The survey of County of Grande Prairie staff was intended to determine the knowledge base among teachers within the County. Some presearching for survey instruments was undertaken, but in general these instruments were found to be unsuitable for use in this study as they were unable to discriminate between an intelligent general knowledge and expertise (Montgomerie, 1981).

As a result a specific item questionnaire was developed, field tested, and distributed to County of Grande Prairie teaching staff. The instrument was designed to determine teachers' academic backgrounds, formal or informal experiences with computers, interest in computers in education, past participation in inservice activities, and willingness to become involved in the implementation of computer technology in the classroom. One further purpose of this survey was to identify teachers who could act as resource persons within individual schools.

School System Visits. Preliminary analysis of the survey of superintendents enabled the research team to identify six school districts to visit for further study. The criteria for selecting these systems were:

1. A system or systems which had been involved in the implementation process for several years.
2. A system or systems which had recently implemented a large-scale project.
3. A system or systems which had developed a successful teacher inservice program.
4. A system similar to the county of Grande Prairie (minimal involvement in computer technology implementation).
5. A system or systems involved in an innovative computer technology program.

TABLE 1.3 lists the systems visited and the criteria by which they were selected.

TABLE 1.3

School Systems Visited During Project

System	Criteria for Selection	Visited by
County of Lac Ste. Anne No. 28	4	R. Gilchrist
Medicine Hat School Division No. 4	2, 3	R. Gilchrist
Medicine Hat School Division No. 76	2, 3	R. Gilchrist
Medicine Hat Roman Catholic School District No. 21	3	R. Gilchrist
Red Deer School District No.1 104	1, 3	H. Sanders
Sturgeon School Division No. 24	2, 3, 5	H. Sanders

Much useful comment was also derived from less formal contacts with a number of school systems throughout the province. The research team greatly appreciated the contribution of project coordinators in the systems visited.

Literature Review A review of the literature was undertaken to gather information on computers and computerization in school and school systems. A particular emphasis was placed on defining the role of the computer in education and in reviewing the findings of previous computer projects.

Data Analysis Framework

Because much of the data collected is either descriptive or anecdotal, the majority of the analysis consists of tabulation of responses to questions. A more thorough statistical analysis, although considered, was not felt to be necessary for the achievement of the main purposes of the project.

Design of the Report

The report has been organized in the following manner. The initial chapter deals with the design and management of the study. Chapter 2 presents a survey of the literature, with particular emphasis on the multiple roles that the computer may play in the instructional process. Chapter 3 reports on and discusses the findings of the two survey instruments, and Chapter 4 reports observations made about the six school systems visited. Chapter 5 discusses the findings generally, as they pertain to the development of suitable computer technology implementation strategies, and Chapter 6 develops specific strategies for use in the County of Grande Prairie. Chapter 7 presents recommended strategies both for the general model and for the County of Grande Prairie.

The appendices contain copies of the survey instruments.

Management of the Project

The study was conducted by Richard Gilchrist, Principal of Sexsmith Secondary School and Hugh Sanders, Math Consultant at the Grande Prairie Regional Office of Alberta Education. Dr. Don Richards of the Department of Educational Administration at the University of Alberta served as an advisor to the project.

The study team reported to a steering committee appointed by the Director of the Planning Services Branch of Alberta Education. Committee members were:

Dr. H. Sherk, Planning Services Branch, Alberta Education
Mr. L. Beaudry, Superintendent of Schools, County of Grande Prairie No. 1
Mrs. Y. Romanko, School Trustee, County of Grande Prairie No. 1

The steering committee met at the completion of each phase, and their advice and encouragement was of great benefit to the project.

CHAPTER 2

LITERATURE SURVEY

Introduction

The major thrust of the literature survey was to gather data concerning the role of the computer in the instructional process. After delineating the need for school systems to become involved in computer technology, the discussion centres on possible uses of the computer. In particular, the idea emerges that since the computer can serve a number of functions within the educational process, it can be an important tool for educators.

Technology in Education

Man's progress tends to consist of occasional significant leaps in technology followed by long periods of consolidation and application.

The beginning of modern civilization is associated with the discovery of agriculture, some 10,000 years ago. Since man no longer had to wander in search of food, he was able to establish permanent population centres. Food surpluses allowed for the development of trade in goods and ideas. The acquisition of knowledge, which was not directly supportive of survival, could now begin. Advances in food production allowed society to support secondary, non-producing activities. The process of education began in the desire to pass this knowledge on to future generations.

The history of educational technology is checkered with notable events. Hallworth and Brebner (1980), in their research monograph "Computer Assisted Instruction in Schools", identify the invention of the written word and the printing press as technologies which led to important changes in the delivery of education. Certainly today's classroom gives ample evidence of our reliance on the printed word as a means of disseminating information, but the main thrust of the formal education we receive is directed toward the development of verbal and written communication skills.

Until comparatively recently it was generally accepted that the written word was an eminently successful vehicle for passing on man's limited storehouse of knowledge. However, since the mid-twentieth century, advancing technology has led to an unprecedented explosion of new knowledge, knowledge that is growing at a rate far in excess of the ability of the written word to cope. It is evident that traditional communication modes are becoming too cumbersome to be effective tools for large-scale transfers of information.

During the last two decades, technology has improved because a new tool, the computer, has arrived to aid in the handling of this vast, expanding knowledge base. The advent of the microprocessor has allowed for the development of inexpensive, powerful computers which are rapidly taking more and more of the information burden from our shoulders. Computers are a reality.

So the question is asked, "When will educators leap to take advantage of this new technology?" This technology may make as profound a change in the methods of information processing as did the written word and the printing press.

Just as the book led to mass literacy, so shall the advent of the home computer require the development of an analogous skill. Yet the textbook, as a technology readily available to educators, did not become universally incorporated into the regular school program until well into the nineteenth century. The impact of modern technology is felt much more quickly but there is still a discernable lag between the availability of technology and its incorporation into the educational process.

The recent introduction of inexpensive personal computers, video games and electronic calculators has brought the latest technology to everyone. Educators are bringing the computer into the classroom. The problem that faces us at present is how to incorporate the computer into the educational process.

A new technology usually requires new instructional strategies to take advantage of its capabilities. A report, prepared by the American Association of School Administrators, (Knesevich and Glen, 1970) outlines the potential that a new technology may possess for the delivery of instruction. This potential includes such diverse advantages as:

1. increasing the automation of learning,
2. individualizing instruction,
3. developing simulation situations not possible with conventional methods,
4. strengthening research, and
5. aiding in the management of instruction.

Among the disadvantages, the report stresses a concern that machines should aid the instructional process; control must remain in the hands of the educator.

The Role of the Computer

One of the primary concerns in implementing a new technology is in ensuring that the system is flexible enough to be adaptable. Just as technology advances, so must its application be allowed to evolve, provided that such evolution is to the benefit of education. It is therefore safe to assume that computer technology will play an increasingly important role in human learning. Therein lies a problem, for computer technology is poorly understood by most, and even the "experts" have difficulty adjusting to the speed with which computer technology is advancing. Taylor (1980) says:

> Few people outside the computing community have anything but the vaguest concept of that role or its form, for two reasons. First, technical innovations has come so fast in computing that even the expert can barely keep up with it. Second, the effort to apply computing to education is less than 25 years old; though an immense body of work has already accumulated, it has been poorly publicized to the larger public... Nevertheless, with the advent of microprocessors... thousands of educators and parents are beginning to seriously ponder what the role of computing will be in human learning and what action they can and should take to effect it.

Computers in the School

The application of computing to education is a most complex activity. In an attempt to organize this complexity, Taylor (1980) has developed a framework of three modes of application, namely "Tutor", "Tool" and "Tutee". These three modes describe how the computer functions in the educational process.

The Tutor Mode. In the tutor mode, the computer functions as the instructor. The delivery of instruction by computers has been heralded as the major advantage that technology will give to education. Computer Assisted Instruction (CAI) can be thought of as comprising three components which differ in level of complexity (Ragsdale, 1982). In the least complex form, drill and practice, the computer presents sequences of problems to the student. This is the most common and least expensive format for CAI. Tutorial CAI uses a sequence in which the computer presents instructional material to the student, tests for understanding, then presents more material selected on the basis of the student's performance. Ragsdale contends that the third and most complex form, dialogue CAI, does not yet exist. In dialogue CAI, the computer would enter into dialogue with the student, responding to a wide range of inputs. Some researchers suggest that the development of artificial intelligence will open up the full potentialities of dialogue CAI.

The Computer as a Tool. To function as a tool, the computer need only be programmed with some useful capability. Computer applications for the business world have developed rapidly in recognition of the computer's capability of performing routine tasks with great efficiency. One of the tasks of education is developing in the student, an understanding of the usefulness of the computer as a tool.

Computer Managed Instruction (CMI) is one application of the tool mode that has been developed for education. In a CMI system, the computer is used to maintain records of student progress and in some cases prescribe further instruction. However, unlike the CAI model, CMI programs leave the actual instruction to the teacher and delivery of instruction to other media, which may include CAI programs. School-based CMI programs represent a link between the instructional and administrative functions of the school.

The Tutee Mode. In using the computer as a tutee, the student or teacher becomes the tutor. In learning how to teach the computer, through learning high level programming languages, the student gains an understanding of the computer which will be of benefit in obtaining the maximum performance from the tool. One further advantage is that the student will learn to develop problem-solving strategies. The computer makes an ideal tutee in that it has infinite patience and has to be shown how to perform every task.

Seymour Papert, the main proponent of this role for the computer, has developed a simple instructional language, LOGO, through which young students can teach a computer to do things. Learners gain new insights into their own thinking processes through learning to program. Through the use of the computer as tutee, education can focus on processes rather than products (Taylor, 1980).

Computer Literacy

The idea of computer literacy as an essential skill for students first emerged in the late 1960's, but the meaning of the term "literacy" has changed over time. Initially, computer literacy was taken to mean a level of understanding which enabled students to talk about computers, but involving little or no experience in working with them. The advent of cheap microcomputers has now made the technology more readily available and thus the meaning of computer literacy today involves to a large extent actually working with computers. The Alberta Education Computer Literacy Steering Committee has adopted the following definition of computer literacy:

> To be computer literate one must be able to describe, demonstrate and/or discuss (critically) how computers are used; how computers do their work; how computers are programmed; how to use a computer; and how computers affect our society. (Brumbaugh, 1980).

The student, to become computer literate, must experience the computer as a tutor, use the computer as a tool and learn to be the teacher of the computer in the tutee mode. Ragsdale (1982 p.89) contends that the most urgent problem presently facing education is to develop computer literate students. As a short term goal, those closest to graduation from high school should be the primary target group since the older students are the ones in most urgent need. This view contrasts with the direction being taken by Alberta Education, which has concentrated on developing literacy programs at the elementary level. In the longer term, it is quite probable that literacy will be achieved at an early age and that more attention can be devoted to using computers rather than learning about them.

Certainly, in the short term literacy will have greater importance for computer educators than will direct instruction.

Implementing Computer Technology

The problem of integrating a new technology into the educational enterprise is not solely the province of any one group. Understandably, politicians, who control educational decision-making, have some reservations about committing resources to a technology whose record is one of ever accelerating advances and instant obsolescence. Why pay twice as much today for a machine which tomorrow will be not only cheaper but also outmoded? The committed are viewed as being irresponsible with the public purse. Not surprisingly there is some skepticism and political resistance to innovation, but if education is to effectively utilize computing technology, the resistance must be overcome.

Petruk (1981), observes in his study of the development of microcomputers in Alberta schools:

> Many schools have begun to recognize the impact that the introduction of microcomputer technology has had on society and have tried to respond to that impact by introducing microcomputers into the classroom... However, introduction of microcomputers in Alberta schools has generally occurred as the result of the initiative of enthusiastic teachers, principals or in some instances school boards... the nature and extent to which microcomputers have been introduced into Alberta schools has been sporadic.

This ad hoc approach to implementation must change. School boards must plan cohesive and comprehensive strategies for implementing a technology which has the potential to revolutionize the delivery of education.

Summary

The literature points out that the computer can be applied to the educational process in three distinctly different modes. These modes--tutor, tool and tutee--encompass the use of the computer as a teacher in the delivery of instruction, as a machine to handle the information flow, and as a patient student to teach. Through the latter mode students may come to more fully understand their own thought processes.

There is a need to develop a coordinated approach to integrating the technology into the educational process.

CHAPTER 3

FINDINGS AND INTERPRETATION OF DATA

Introduction

The data gathering phase of the project consisted of a survey of all superintendents in the province of Alberta, a survey of all teachers in the County of Grande Prairie No.1, and visits to six Alberta school jurisdictions where personnel in charge of computer implementation projects were interviewed. (The report on visits to school jurisdictions appears in Chapter 4.)

In this chapter, the results of the two survey questionnaires are discussed and the major findings summarized.

Section I

Survey of Alberta School Superintendents

Structure of the Instrument

The first task of the survey of school superintendents was to determine the existence of school board policies regarding the use of computers in schools; the second concerned questions related to computer hardware and the third was to determine the extent to which school systems have developed teacher inservice programs. The respondents were categorized according to the size of their school system. Small systems were defined as having fewer than 50 teachers, mid-size systems as employing from 50 to 300 teachers, and larger systems as employing 301 or more teachers.

Of the 110 questionnaires distributed, 93 were returned for an 85% return.

Board Policy Regarding the Use of Computers in Schools. As indicated in TABLE 3.1, very few boards have addressed the use of computers in schools through policy directives; however, several boards have been involved in the process of encouraging schools to introduce the technology.

When policies and guidelines do exist, they usually address the following areas:

1. Goals for computer education,
2. Defining major emphasis,
3. Projected funding commitments,
4. Phased introduction, and
5. Projected inservice needs.

TABLE 3.1

Board Policy Regarding The Use of Computers in Schools

	Small Systems N=27	Mid-Size Systems N=54	Large Systems N=12	Total Survey N=93
Policies in Place	1 (4%)	3 (5%)	2 (17%)	6 (6%)
Policies in Preparation	1 (4%)	3 (5%)	2 (17%)	6 (6%)
Board Approved Guidelines in Place		5 (9%)	2 (17%)	7 (8%)

Hardware Distribution. As indicated in TABLE 3.2, approximately half the school systems in the province have made computer technology available to all students at the school level. This is true for very large systems as well as for those

TABLE 3.2

Distribution of Computer Hardware

Questionnaire Item and Number		Responses			
		Small Systems N=27	Mid-Size Systems N=54	Large Systems N=12	Total Survey N=93
Question A2					
All schools in the system have at least one computer in operation	Yes	13 (48%)	21 (39%)	6 (50%)	40 (43%)
	No	14 (52%)	33 (61%)	6 (50%)	53 (56%)
Question A3					
The average number of computers in the elementary schools in the system tend to have is:	2	7 (26%)	8 (14%)	1 (8%)	16 (17%)
	1 or 2	9 (33%)	30 (56%)	10 (84%)	50 (54%)
	none	11 (41%)	16 (30%)	1 (8%)	27 (29%)
Question A4					
The average number of computers the junior high schools in the system tend to have is:	2	8 (30%)	14 (26%)	7 (59%)	29 (31%)
	1 or 2	9 (33%)	32 (59%)	4 (33%)	44 (48%)
	none	10 (37%)	8 (15%)	1 (8%)	20 (21%)
Question A5					
The average number of computers the senior high schools in the system tend to have is:	2	10 (55%)*	34 (63%)	12 (100%)	56 (67%)
	1 or 2	7 (39%)*	16 (30%)		23 (27%)
	none	1 (69%)*	4 (7%)		5 (6%)

* 9 small school systems have no senior high school.

with few schools. The mid-size systems appear to have lagged behind in this area. It may be speculated that within the next year these figures will change rapidly towards one hundred percent availability.

One factor that may be impeding the deployment of computers in mid-size systems is the range of school size present in many of these systems. Many mid-size systems have several very small schools within their jurisdictions, and typically, small schools do not as yet have a computer.

The remainder of TABLE 3.2 indicates the definite trend towards greater availability of computer technology in the senior high school program, which can also be seen very clearly in Chart 3.1 and it was observed during school system visits and interviews.

Chart 3.1 illustrates that the distribution of hardware has proceeded to a much greater extent at the senior high level than elsewhere.

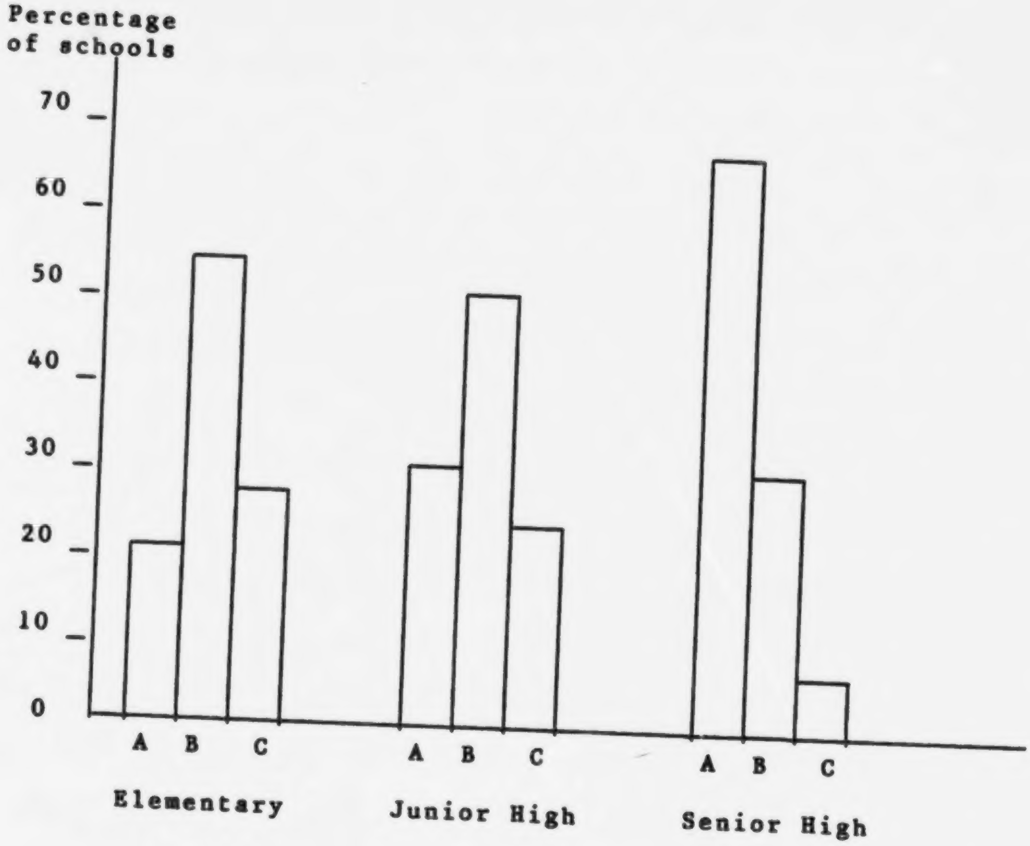
This may be in part a result of:

1. The rapid rise in the use of computers by the business community, necessitating the introduction of computer skills such as word processing at the high school level,
2. An effort by vocational schools to keep abreast of current technology,
3. A rapid rise in the popularity of computing science courses at the post-secondary level producing a renewed interest in computing science at the high school level,
4. Larger budgets giving high schools greater flexibility to purchase computers, and
5. Student self-motivation being responded to by schools.

In many senior high schools the thrust in computer education is geared to application of the technology, whereas in the elementary and junior high the emphasis is clearly on awareness and literacy.

CHART 3.1

Average Distribution of Computers by Grade Division



A = More than Two B = One or Two C = Not Yet Introduced

Computer Hardware Frequently Purchased. As indicated in TABLE 3.3, the province of Alberta has adopted the Apple format (Apple and Bell and Howell). However this has occurred largely as a result of Alberta Education's support of the Bell and Howell computer. The Commodore computers have found greater acceptance in high schools where they are used extensively for business education applications.

Peripheral Devices. As indicated in TABLE 3.4, the vast majority of computers are equipped with either single or double floppy disk drives. There is little doubt that the floppy disk storage medium is both faster and more convenient than the cheaper cassette storage medium. However, the second generation machines being used for computer literacy may well need only cassette storage. As yet, hard disk storage devices are rare. This is probably a function of cost as well as the fact that few schools have applications in place which require such massive storage capabilities as are offered by hard disk devices. If greater use of centralized computer labs becomes a reality, hard disk devices feeding to several microcomputers may become an economical alternative.

Printers are not yet available to all schools and generally, where used, are of the dot/matrix variety. The "letter quality" printers are used mainly in high schools.

Centralized Computer Access. TABLE 3.5 shows that 27% of the respondents indicated that their system had access to a centralized computer, but of these only a few were used by the

TABLE 3.3

The Make of Computer Most Frequently Purchased

Question A6 Format	Percentage of Responses
Bell and Howell	31
Apple	48
Radio Shack	3
Atari	2
Commodore	16

TABLE 3.4

Peripheral Devices Available to Schools

Question A7			
Please indicate which peripheral devices are available to schools in your system:	Percentage of Responses		
	Elementary	Junior High	Senior High
Single Floppy Disk Drives	52	52	48
Dual Floppy Disk Drives	31	42	70
Hard Disk Storage Devices	2	2	7
Dot/Matrix Printer	38	48	65
Letter Quality Impact Printer	5	8	32
Communications Modem	1	1	9
Graphics Input Tablet	2	5	16
Music Synthesizer	0	1	1
Cassette Storage Devices	25	22	11
Plotter Printer		1	1
Card Reader			1

TABLE 3.5

Access to and Use of Centralized Computer

	Small Systems N=27	Mid-Size Systems N=54	Large Systems N=12	Total Survey N=93
Question A8				
System Access	1 (4%)	10 (19%)	10 (83%)	25 (27%)
Question A9				
School Administration Use	0%	2 (4%)	9 (75%)	10 (11%)
Question A10				
Instructional Use	0%	0%	1 (8%)	1 (1%)

schools for administrative purposes and in only one case was the computer used for instructional purposes.

Purchase of Hardware. In purchasing microcomputers, the general tendency would appear to be control through centralized budgets (TABLE 3.6). This of course may be a function of system accounting procedures. For example, in the County of Grande Prairie No. 1, schools have some control over decentralized supply budgets, but capital items such as microcomputers are handled through centralized budgets.

One great advantage of centralized purchasing of computer hardware is coordination with system goals, where these have been established. Although individual schools have shown great initiative in the purchase of microcomputers, there has been a tendency for a somewhat ad hoc approach to program implementation especially where there is little or no central coordination. Such is presently the case in the County of Grande Prairie.

TABLE 3.6

Hardware Purchase

Question All The purchase of computer hardware is handled through:	Small Systems N=27	Mid-Size Systems N=54	Large Systems N=12	Total Survey N=93
Centrally Administered Budget	37%	69%	92%	48%
School-Based Budget	37%	30%	67%	30%
Cost Sharing Between Central and School-Based Budgets	7%	22%	8%	13%
Other	7%	7%	17%	15%
No Response	12%	9%	0%	13%

TABLE 3.7

Coordination of Computer Education

	Yes	No	No Response
Question B1 The system employs a coordinator for computer education	11%	81%	8%
Question B 2 A central office administrator has been assigned responsibility for computer education as part of his/her responsibilities.	48%	40%	12%
QUESTION B 3 Each school has a staff member who acts as a resource person.	62%	24%	14%

One source of funding frequently referred to by respondents is private fund-raising by individual schools, students' unions and parent groups.

Coordination. Table 3.7 illustrates the level of coordination of computer education in the province. Ten systems responded affirmatively to question B1; however, qualifying notes indicated that the coordinator was at the curriculum director level and usually had other curricular responsibilities, typically in mathematics and science. Only larger systems appear to have the resources for a full-time computer education coordinator.

Less than half the systems responding to the questionnaire indicated that coordination of computer education is done at the central office level. This may indicate the ad hoc method with which computer education has been introducted to many smaller and mid-size systems. Many returns indicated as well that systems were only in the formative stages of implementing computer technology.

In most of the schools visited, one or two staff members were actively engaged in developing computer awareness among staff members. However, some systems such as Medicine Hat School Division No. 4 have developed a cadre of key teachers who have participated in a more intensive inservice program.

Inservice Activities. This part of the questionnaire was intended to determine what types of inservice in computer education school systems are offering and the perceived impact of this inservice.

System Sponsored Inservice. TABLE 3.8 shows that one-third of all responding systems have not offered any computer inservice education to teachers, and TABLE 3.9 shows that this situation is not confined to small school systems.

Further analysis shows that systems which were implementing computer technology in a coordinated fashion were also involved in sponsoring teacher inservice education. In the case of the

TABLE 3.8

System-Sponsored Inservice Education

Question B 4 The system has sponsored inservice for:	Yes	No	No Response
All Teachers in the System	40%	26%	34%
Selected Teachers From Each Grade Level	12%	28%	60%
Selected Teachers From Each School	41%	18%	41%

TABLE 3.9

Distribution of No or None Response to B4 System Size*

Small Systems	N=27	56%
Mid-Size Systems	N=54	56%
Large Systems	N=12	8%

*Includes 34 questionnaires where the question was not answered and 11 questionnaires where all responses were negative.

Medicine Hat school districts, inservice education has been expanded to include support staff.

Analysis of the data in TABLE 3.10 showed that only 48 systems have offered system-sponsored inservice activities. All systems which responded to part a) also responded to part b) of question B 5. One large system indicated that it conducted inservice projects during school vacation time.

TABLE 3.10

Times for System-Sponsored Inservice Activities

Question B 5 System-sponsored inservice activities have been conducted:	Actual Responses
a) During School Operational Time	40
b) In the Evenings or on Weekends	48

Resource Persons. Local resource persons, in many cases system teachers, appear to have carried the bulk of the load in system-sponsored inservice (TABLE 3.11). This may be a function of either cost or teacher willingness to accept in-service from their peers. Three questionnaires had comments about teachers' resistance to outside "experts."

Results of Inservice Education. Many questionnaires on which previous questions had not been answered had responses to question B 7 (TABLE 3.12). Since it can be assumed that in these

TABLE 3.11

Sources of Inservice Resource Persons

Question B 6 In conducting inservice education in the educational use of computers, the system has employed outside resource persons from:	Actual Responses
Other Provinces	8
Alberta Universities	24
Alberta Education	28
Alberta Educational Communications Corporation	17
The Computer Manufacturing and Distribution Industry	29
Other Local Experts in the Field	48

cases the question was answered in more general terms, the results are not reliable for describing system-sponsored inservice education. However, if one assumes other agencies have sponsored inservice activities, the responses may have some significance. Of note is the tendency toward increased activity at the higher grade levels, which is consistent with the manner in which computer hardware has been distributed.

With inservice activities having been geared to instructional uses,it is not surprising that the use of computers in school administration has not progressed at the same rate. In fact, one larger system has a policy which does not allow administrative uses, and the use of computers in administration has a fairly low priority with most school systems as well as with Alberta Education.

School System Priorities. As indicated in TABLE 3.13, the

TABLE 3.12

Results of System-Sponsored Inservice Education

Question B 7 To what extent do you feel that system-sponsored inservice activities have resulted in the following:	Actual Responses Not Noticeable	 Increased Activity	 Considerably Increased Activity
Increase in the Awareness of Computers Among School Staffs	3	21	46
Increase in Requests for further Inservice Education	5	38	27
Increase in the Use of Computers For Instruction in the Classroom at the Elementary Level	16	39	15
Increase in the Use of Computers at the Junior High Level	11	36	23
Increase in the Use of Computers at the Senior High Level	5	28	37
Increase in Requests for Hardware Purchases	8	30	32
Increase in Requests for Software Purchases	5	22	43
Increase in the Use of Computers in School Administration	24	34	12

TABLE 3.13
Thrust of Computer Use

Question B 8

Please indicate the major thrust of your program.		Actual Responses	
		Major Thrust	Some Use
Elementary Schools	Computer Literacy	49	1
	Computer Assisted Instruction	25	34
	School Administration	5	32
	No Specific Program Emphasis	2	8
	Other*	1	8
Junior High Schools	Computer Literacy	57	17
	Computing Science	15	20
	Computer Assisted Instruction	22	40
	Guidance and Testing	2	17
	School Administration	2	26
	No Specific Program Emphasis	2	4
	Other*	1	3
Senior High Schools	Computer Literacy	51	19
	Computer Science	44	17
	Computer Assisted Instruction	19	35
	Guidance and Testing	13	13
	School Administration	14	26
	Business Education	37	21
	Industrial Education	10	11
	No Specific Program Emphasis	1	3
	Other*	0	0

* "Other" includes: Test Item Bank Development, Industrial Education, Drafting

predominant thrust in the province at all levels is clearly computer literacy. This may be a function of the present state of implementation. Most systems are just getting around to implementation, and literacy may be a very necessary beginning in light of the state of staff and student expertise. There is some evidence to suggest that as a system becomes more computer literate the emphasis switches to application of the technology.

Once again the responses reflect the low priority assigned to administrative uses of the computer, which may again be a result of the current literacy level in most systems.

At the senior high school level, the areas of computing science in business education are rapidly adopting the new technology.

Summary of Major Findings

Analysis of the responses in the survey of school superintendents indicated that:

1. The extent of computer technology implementation in the province is rather limited. Little attention has been paid to the development of specific school board level policies in this area.
2. In the distribution of computer hardware, the Apple format micro-computers have become a standard for use in Alberta schools, with some use of Commodore computers. Other formats are not present in significant numbers.
3. Implementation of computer technology in schools has proceeded to a much greater extent at the senior high school level than at the elementary and junior high school levels.
4. The major thrust of programs for the province is the development of computer literacy. Applications of computer technology are most advanced at the high school level, especially in the areas of business education and vocational education.
5. Where inservice programs have been developed, the tendency has been to utilize local resource leaders.
6. About 60% of the school systems responding indicated that they have central coordination of computer technology implementation programs.
7. Thirty percent of the respondents indicated that computers had not yet been introduced to schools in the system.

Section II

County of Grande Prairie No. 1 Staff Survey

The purpose of this survey was to assess the knowledge of the staff in the County of Grande Prairie about computers. The survey focused on the formal training staff members have had, the extent to which they have participated in inservice activities related to the use of computers in schools, and their interest in computer-related activities in schools.

Questionnaires were coded by individual and by school. As indicated in TABLE 3.14 the return rate was 85%.

Summary of Responses

TABLE 3.15 is a summary of responses to the questions of the survey. As in the survey of superintendents, the data has been separated into two groups, elementary and secondary teachers.

TABLE 3.16 is a summary of formal training experiences of the staff members of the County of Grande Prairie No.1 relative to computer technology. It is important to note that of the ten respondents who answered "Yes" to question 1 on the survey, nine are secondary school teachers.

TABLE 3.17 is a summary of the write-in responses to question 2 of the survey. It should be noted that approximately twice as many teachers at the secondary level have participated in computer-related inservice activities as have elementary

TABLE 3.14

Numbers of Returned Questionnaires

School Code	Number of Questionnaires Sent Out	Number of Questionnaires Returned
0	20	16
1	22	15
2	6	6
3	6	6
4	1	1
5	32	(24 - 1)*
6	12	10
7	11	11
8	7	7
9	16	11
10	23	21
11	6	6
12	3	2
13	21	20
	187	155**

* One questionnaire was returned blank because the teacher was absent.

** 85% returned

TABLE 3.15

Computer Technology Survey,

County of Grande Prairie No. 1

	Question		Total Response(%)	Elementary Response(%)	Secondary Response (%)
1.	Have you had formal university training in the use of computers that is acceptable to the Teachers Qualification Service for salary purposes?	Yes	10 (6)	1 (1)	9 (12)
		No	145 (94)	77 (99)	68 (88)
2.	Have you participated in teacher inservice activities related to the use of computers in schools?	Yes	41 (26)	13 (17)	28 (36)
		No	144 (74)	65 (83)	49 (64)
3a.	If a computer were made available to you in your school, would you be interested in using it in your classroom?	Yes	125 (81)	63 (81)	62 (81)
		No	26 (17)	13 (17)	13 (17)
3b	Do you feel you have enough knowledge about computers to enable you to use one in your classroom?	Yes	17 (11)	4 (5)	13 (17)
		No	137 (88)	74 (94)	64 (83)
3c	Would you be willing to take university credit courses to upgrade your skills in using computers?	Yes	103 (66)	50 (64)	53 (69)
		No	49 (32)	28 (36)	21 (27)
3d	Would you be interested in becoming a computer resource person within your school?	Yes	48 (31)	19 (24)	29 (38)
		No	105 (68)	57 (73)	48 (62)
3e	Would you be willing to take part in a test to determine your knowledge of computers in education?	Yes	56 (36)	26 (33)	30 (30)
		No	95 (61)	50 (64)	45 (58)
3f	Would you be willing to assist in the development of instructional materials for use on computers?	Yes	61 (39)	25 (32)	36 (47)
		No	88 (57)	50 (64)	38 (49)

TABLE 3.15 (continued)

Computer Technology Survey

County of Grande Prairie No.1

	Question		Total Response(%)	Elementary Response(%)	Seconday Response(%)
3g	Would you be willing to assist in the development of teacher inservice programs?	Yes No	43 (28) 103 (66)	18 (23) 56 (72)	25 (32) 47 (61)
4a	I have access to a microcomputer.		97 (63)	37 (47)	60 (78)
4b	I am interested in participating in computer inservice activities sponsored by the school board.		119 (77)	58 (74)	61 (79)
4c	I am interested in participating in computer inservice activities not sponsored by the school board.		80 (52)	43 (44)	46 (60)
4d	I am willing to take university credit courses related to the use of computers in education.		86 (55)	41 (53)	45 (58)
4e	I own a microcomputer.		13 (8)	5 (6)	8 (10)
4f	I have access to a microcomputer outside school.		15 (10)	8 (10)	7 (9)
Number of Responses			155	78	77

teachers (TABLE 3.15).

Write-in responses to question 5 of the survey are summarized in TABLE 3.18. The number of people who responded to this item would seem to reflect the high degree of interest and concern among teachers relative to computers in education.

As indicated in TABLE 3.19, there is a very high degree of willingness among teachers in the County of Grande Prairie No. 1 school system to participate in computer-related inservice activities.

Resource Person. Of the teaching staff in Grande Prairie, 31% are interested in becoming a computer resource person within their school. As indicated in TABLE 3.20, at least one person in each school answered "Yes" to question 3d.

In order to analyse the degree to which people are willing to act as resource persons, a second factor (question 3g) was combined with the above information. Only those respondents answering "Yes" to both 3d and 3g are included.

Only 20% of the respondents answered "Yes" to both questions. Three schools did not have a person on staff who answered in this way, but all other schools were represented.

When both questions are included it is clear that there is sufficient interest among staff members of the County of Grande Prairie for the introduction of computers into the schools.

Computer Resistance Factor. For the purpose of this study a person who might possibly resist computer implementation is one who:

1. has had no formal training in the use of computers,
2. has not participated in any inservice activity,
3. is not interested in using a computer in his or her classroom,
4. does not have enough knowledge to use a computer in his/her classroom,
5. is not willing to take credit courses in computers,
6. is not interested in becoming a computer resource person,
7. will not assist in the development of instructional materials for use on computers,
8. will not assist in developing teacher inservice programs, or
9. will not participate in credit or non-credit inservice activities whether school board-sponsored or not.

In particular, those respondents who answered negatively to questions 1, 2, 3a, 3b,3c,3d,3f,3g and indicated no response to 4b, 4c, or 4d were defined as possible resisters. TABLE 3.21 indicates that 15 respondents located in seven schools could be described as possible resisters. The presence or absence of a resister on a school staff is independent of whether a school has or does not have a computer; however, ten resisters were located in three schools that did not have a computer. The incidence of the resistance factor seems to have been reduced considerably in those schools that have a computer.

A Teacher Profile

Examination of the data revealed a response pattern that was representative of most teachers who returned the questionnaire. The yes/no responses and responses which described the respondents were used to develop the profile.

The survey indicated that the typical teacher possesses several characteristics with respect to microcomputers and their use in schools.

TABLE 3.16

Summary of Formal Training Experiences

"Yes" response to the question,

"1. Have you had formal university training in the use of computers .....?."

Individual Respondent (N=10)	Course	Institution	Year
a)	Computing Science 205	Athabasca University	1981-82
	B.A. 205	Grande Prairie Regional College	1982
b)	Computing Science 201	University of Calgary	1974
	Ed. Ps. 501	University of Calgary	1975
	Ed. Ps. 503	University of Calgary	1975
c)	Ed. Admin. 506	University of Alberta	1981
d)	Ed. Admin. 505	University of Alberta	1981
e)	Computing Science 221	University of Calgary	1973
f)	Math 131	Waterloo	1968
g)	Ed. Admin. 547/548	University of Alberta	1982
h)	63230	University of Guelph	1969
	Math 295	St. Francis Xavier	1974
	Math 385	St. Francis Xavier	1974
	Math 400	St. Francis Xavier	1975
	89202	University of Guelph	1969
	89310	University of Guelph	1969
	89322	University of Guelph	1069
	Econ. 270	St. Francis Xavier	1974
i)	Computing Science 1600	Not Indicated	1977
	Stats 1770	Not Indicated	1977
	Math 1000	Not indicated	1976
j)	Secretarial Science 202	Grande Priaire Regional College	1982

TABLE 3.17

Summary of Inservice Activities Related to Computers in Schools

Activity	Frequency
A.T.A. Specialist Councils	9
Staff Inservice Education	6
Non-Credit College Course	3
Introductory Sessions on Apple and Plato	2
Admin-Council Meeting	1
Literacy Course	1
Convention Sessions	1
Business Use of Computers	1
Business Training on Computers	1
Teaching Computer Literacy	1
Masters Degree	1

TABLE 3.18

Summary of Write - In Responses (Question 5)

Write-in responses to question 5 have been re-phrased and grouped according to four categories: budget, inservice, personal and experience. The question was, "Please add any comments about your involvement in the use of computers in education." (The frequency of response has been included at the right.)

		Frequency
Budget	Money for software should be allocated.	1
	One computer per school is not enough.	1
	Computers are important in small schools too.	1
	One type of computer should be purchased.	1
	Computers should be used in all grades.	1
Inservice	There is a need for inservice education on use of computers.	3
	Inservice education would be better if all schools had a computer.	2
Personal	Limited knowledge about computers.	5
	Desire to learn about computers.	3
	Not yet ready to devote time to learn about computers	3
	My negative responses could change as I become more familiar with computers.	1
	I would like to use a computer in a resource room.	1
	I would like to see a computer used for enrichment, not only remediation.	1
	Why computers-not enough money to go around as it is.	1
	The board is pushing the use of computers. Perhaps it has a major responsibilitay for financing of competency.	1
	I am too close to retirement - no use.	1
	I am going to buy a computer.	1
	I used a computer as a student.	1
Experience	I have taught a course on word processing	1
	I currently teach computer literacy.	2
	I am using a computer in my classroom.	1
	I am acting as a resource person.	1
	I am self-taught.	1
	I am writing programs for clerical and administrative use.	1

TABLE 3.19

Willingness to participate in Inservice Activities ("Yes" response to questions 4b,4c, or 4d or any combination of the three)

Question

4b I am interested in participating in computer inservice activities sponsored by the school board.

4c I am interested in participating in computer inservice activities not sponsored by the school board.

4d I am willing to take university credit courses related to the use of computers in education.

School Code	Response
0	11
1	11
2	5
3	2
4	1
5	21
6	10
7	8
8	4
9	8
10	17
11	6
12	2
13	20
	126*

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* 81% of returned questionnaires.

TABLE 3.20

Resource Person Analysis (by School)

Question

3d Would you be interested in becoming a computer resource person within your school?

3g Would you be willing to assist in the development of teacher inservice programs?

School Code	Number of Teachers Answering "Yes" to 3 d and 3 g	"Yes" to Only 3 d
0	2	3
1	2	4
2	1	3
3	0	1
4	1	1
5	4	7
6	2	2
7	3	3
8	0	2
9	2	2
10	8	8
11	1	5
12	0	1
13	5	6
TOTAL	31 (20%)*	48 (31%)*

* % of returned questionnaires.

TABLE 3.21

Computer Resistance Factor

School Code	Number of Respondents	Number of Resisters*	Computers In Schools (Yes/No)
0	16	5	No
1	15	1	Yes
2	6	1	No
3	6	4	No
4	1	0	No
5	23	0	Yes
6	10	0	Yes
7	11	1	Yes
8	7	0	No
9	11	1	Yes
10	21	2	Yes
11	6	0	No
12	2	0	No
13	20	0	Yes
Total	155	15	

A resister is a respondent who answered "No" to questions 1, 2, 3a, 3b, 3c, 3d, 3f and 3g and indicated no responce to 4b, 4c, 4d.

A typical teacher has not had any formal training in the use of computers; if any training has been taken, the teacher will likely work in a secondary school. Little participation in computer-related inservice activities has taken place, but there is a desire to use a computer in the classroom if one were made available. There is a lack of knowledge regarding the use of computers but at the same time there is a willingness to participate in credit and non-credit courses and other inservice activities.

A secondary school teacher would more likely be involved in a leadership role than would an elementary school teacher.

A few notable factors distinguish elementary teachers from secondary teachers:

1. Among secondary school teachers, 12% reported some formal training in the use of computers as opposed to 1% of elementary school teachers.
2. Of secondary school teachers, 36% reported having participated in computer-related teacher inservice activities as opposed to 17% of elementary school teachers.
3. Of secondary school teachers, 78% reported having access to a microcomputer at school as opposed to 47% of elementary school teachers.

Summary of Major Findings

Analysis of the response data for the county staff indicated that:

1. The level of professional training of staff in the area of computer technology is low.
2. Interest amongst staff in the implementation of computer technology in classrooms is high.
3. Willingness to develop personal expertise in computer technology among staff is high.
4. One-fifth of the respondents indicated a willingness to

take a leadership role in the school.

5. In general, secondary school teachers have a higher level of training and exposure to computer technology than do elementary teachers.
6. Approximately 10% of respondents were indentified as being possibly resistant to computer technology in schools.

CHAPTER 4

SCHOOL SYSTEM VISITS

Introduction

The third aspect of the data collection phase involved selecting six school systems for closer study by the research team. This chapter presents a report on visits made to selected school systems and a summary of the major findings.

The criteria for selection of the systems to be visited are outlined in Chapter 1 (pages 10-11). The systems visited were:

1. County of Lac Ste. Anne No. 28
2. Medicine Hat School Division No. 4
3. Medicine Hat School Division No. 76
4. Medicine Hat Roman Catholic School District No. 21
5. Red Deer School District No. 104
6. Sturgeon School Division No. 24

County of Lac Ste. Anne Visit

The County of Lac Ste. Anne is a fairly representative mid-size school system containing a range of school types and sizes. Since system budgets are centrally controlled, the implementation of computer technology is being coordinated through the central office.

The system has pioneered the use of an instructional media centre. With the aid of Elementary Opportunities Fund support, this centre has been used to develop an extensive range of instructional packages in all subject areas.

Because staff members in all areas have been offered the opportunity to develop these packages, there is a high acceptance factor among the teachers. Materials put together by groups of teachers are being used throughout the system, and teachers interviewed expressed positive reaction to this type of instructional support.

The introduction of microcomputers to the system is becoming a major function of the media centre. Teacher inservice is coordinated centrally, and machines can be brought into the centre for group instruction using a very efficient courier system. The centre is also coordinating the purchase, evaluation and distribution of software and the development of related courseware. One major advantage of the use of a media centre is the reduction of duplication of materials.

The system is involved in the elementary literacy pilot at the Sangudo Elementary School. The single computer in the school has been set up as a learning centre in the library. This has proven to be an excellent method of introducing all students in the school to the computer. Teachers in the school are also encouraged to experiment with the computer under the guidance of one of the staff members who is acting as a resource person. These "core" teachers, with their enthusiasm and willingness to share their knowledge, are important.

Medicine Hat Visits

The three Medicine Hat School systems have become involved in the implementation of microcomputer technology only over the past year (1982). The three districts have formed a consortium to develop an extensive teacher inservice program. Member systems share the costs involved, but each system is handling the actual implementation process individually. As a result, the three systems are at somewhat different stages of implementation.

The inservice program began in the spring of 1982, and thus far computer literacy courses have been offered to almost 60% of the teachers in the three systems. The program has had two major thrusts. Initially, teachers who were selected to teach computer-related courses were given extensive inservice preparation. Over a period of seven weeks they were released from teaching duties and brought into a central location where sufficient computers were provided. Inservice was conducted by experts from outside the system and geared specifically towards the major program thrusts that would be implemented in the fall of 1982.

Because a very large number of teachers had expressed interest in improving their own computer literacy, evening courses of 21 hours duration were set up, using instructors provided by Medicine Hat Community College. Sufficient computers are provided so that there can be one machine per two course members. All computers are Apple II+ machines with color monitors and single disk drives.

The major program thrust for each of the systems began in the fall of 1982 and consists of a literacy/programing option aimed at grade 9 students. Consequently, hardware has been concentrated in schools offering this program. The junior high schools visited had computers in a laboratory situation, with eight to twelve computers per school. One grade 1 to 12 school has also developed successful course offerings in Data Processing

20 and Computing Science 30. At the vocational high school in Medicine Hat, computers are being used in the electronics lab, and with the addition of a graphics imput tablet, in the drafting program.

At one high school the HARTS scheduling program is being purchased to help with the development of student schedules for the 1983-84 school year.

Implementation at the elementary level has been less rapid. Two schools are involved with the Provincial Computer Literacy Pilot Program and there is some use of the computer in individual classrooms. However, not all elementary schools have computers as yet.

With the emphasis on literacy and programming, very little software is available. The intention is to introduce the Logo language approach to programming in the elementary schools in September 1983. As a result, some inservice programs have been conducted with this program in mind.

To begin implementation of computer literacy programs in the schools, a group of interested teachers was selected. These "core" teachers have been instrumental in carrying the program to the schools and acting as resource persons with the schools. In most cases these teachers had little or no background in computing prior to becoming involved in the Medicine Hat project; yet its success is in large part a result of their efforts.

All three systems have concentrated hardware in those schools where the "core" teachers had programs ready to run in September 1982. Plans for 1983 include the upgrading of hardware in elementary schools.

Concerns about the program focused around:

1. A feeling of frustration with the Courseware Clearing House operation of Alberta Education due to the slowness with which recommended courseware materials are being communicated to schools,
2. A general lack of software,
3. The high cost of hardware,
4. A negative reaction to computers, by a few teachers, after participating in the inservice program, and
5. A growing frustration among teachers who have had inservice training due to the unavailability of hardware and software in schools.

It is expected that, once the courseware problem has been solved, the nature of inservice training will change to become much more user-oriented. Teachers from various subject areas will be brought together to develop courseware materials for use in the classroom.

As the uses to which computers are put increase, there will probably be a decentralization of computers from the lab situation and into classrooms. This will require portability to accommodate the use situation within a school.

A further future emphasis will likely be to increase the skills of the "core" teachers and to increase their number.

Presently under consideration is the role of the systems' media centres in the coordination and distribution of courseware materials.

Alberta Education has cooperated with the Medicine Hat School systems in developing a research project which has as its major focus the evaluation of the teacher inservice programs discussed above.

Red Deer Visit

Red Deer Public School District has been involved with microcomputers since receiving a grant from the Alberta 75th Anniversary Foundation in 1980. Those interviewed cited several factors that must be considered when a school system becomes involved with using computers in schools. They suggested that:

1. The development of teacher expertise must be coupled with hardware and software purchase,
2. The initial emphasis on placing computers in their high school could be questioned,
3. Centralized leadership in the area of computers is of vital importance,
4. Standardization of hardware is of vital importance,
5. Centralized software purchasing is essential. Back-up copies of all software used in the district should be kept in central office. Purchase of software by schools should not be done unless it goes through central office,
6. Central office should publish a catalog of software available to schools,
7. Inservice activities for all schools should be coordinated centrally,
8. All schools should have a master set of diskettes for MECC, Courseware Magazine and Conduit (IOWA Consortium),
9. The focus of the use of computers will shift from computer literacy to the use of computers as a tool in the educational process.

Staff in Red Deer strongly recommended ensuring that centralized leadership is provided for the purchase of hardware, coordination of software purchase and teacher inservice activities.

Sturgeon School Division Visit

Sturgeon School Division described the Computer Pilot Program as a program designed to implement: the Alberta Education Computer Literacy materials in elementary schools, a Group B Option in junior high schools, and Data Processing 20 in senior high schools. Staff mentioned the following factors as being very important in their project:

1. An implementation committee consisting of teacher volunteers from each school was formed and assisted in the development of district plans for hardware purchase and initial inservice training of teachers to teach the above programs.
2. Several subcommittees as listed below were formed:
   a) furniture and facilities
   b) inservice
   c) pilot (computer literacy)
3. Many teachers are involved in the program.
4. District-supported training sessions for pilot teachers at several universities.
5. As a part of the computer pilot a list of hardware requirements was established for each area of focus - elementary, junior high and senior high. Issues related to the storage of computers, furniture requirements, electric power requirements, security and the placement of computers were also addressed.

The district has not coordinated the purchase of software, but has left those decisions to its schools. The idea of having computers available to teachers for a year prior to expecting teachers to use them in class was also emphasized.

Summary

Visits to the selected school systems provided some useful insights into the problems and successes that can be encountered when implementing computer technology in schools.

Although not common to all the systems visited, some general observations are worthy of note:

1. An inservice program for teachers which is synchronized with the implementation of system hardware and software is important.
2. Central coordination is important to the success of the implementation process.
3. "Core" teachers within the school play a key role.

CHAPTER 5

DEVELOPING AN IMPLEMENTATION MODEL

Introduction

In the preceding chapters, considerable attention has been paid to the gathering and interpretation of data. This chapter attempts to meld inferences drawn from the interpretation of this data into a model for implementing computer technology in the schools. In addition, this chapter outlines some basic considerations that a school system will face in developing a specific computer technology implementation plan.

An Implementation Model

Throughout the data gathering phase, and particularly during the visits to school systems, the researchers explored methods which school systems had used to handle the problem of implementing computer technology. While no set pattern of implementation emerged, there were some common tendencies which centred around two major considerations: how to develop system literacy, and how to integrate computer technology into the instructional program.

The literature indicates that there are three distinct computer functions: Tutor, Tool, and Tutee (Taylor 1980). If this is so, at what stages should these functions be introduced?

Although there is considerable debate about the impact of computers when used in the tutor mode, research for this project would indicate that for the present the major thrust of computer education in the province will be towards developing student computer literacy. As yet, large-scale application of Computer Assisted Instruction is not occurring. In general, where the computer is used as an instructional device, it is additional to the curriculum rather than an integrated part.

Over the next few years there will likely be an increase in the level of computer literacy among educators. As this general level of literacy increases, so will the demand for a greater involvement of computers in the delivery and management of instruction.

Goal Identification. In order for an individual school or school district to identify a goal, a period of inservice education or sensitization to a new idea must take place. The establishment of a goal requires a certain amount of knowledge about something new and a vision regarding how a new idea can be applied to existing situations. For example, a goal to use the word processing capabilities of a computer in language arts classes requires knowledge about word processing and also a concept of how this computer function could be used in a language arts class.

Hardware/Software Purchases. The selection of hardware requires some knowledge about available hardware, of how compatible the different computers are with established goals for use, and available software. As in goal identification, a period of inservice education is required prior to purchase of hardware or software. Initially, these two activities must be considered together because of their interdependence. Once selections have been made, a further period of inservice education is required to familiarize staff members with the operation of hardware components and the intricacies of the software packages purchased.

During the selection process, the application aspect of computer implementation must not be overlooked. Software must be selected with the view that the use of the software will help an individual school or school district achieve a goal.

Computer and Software Used as a Tool. Inservice education pertaining to hardware and software does not end with familiarization. Effective use or application of a computer and its software complement will be achieved if teachers know how to use the technology effectively with children. The use of computers in resource rooms (Computer Assisted Instruction), in libraries (Data Management), and in individualized instruction (Computer Managed Instruction), serve as only a few examples of computers as tools to assist teachers in carrying out the education process.

Role of the School Board

A school board should make a decision about the use of computers in schools under its jurisdiction. This decision may or may not become a formal part of the Policy and Procedures which govern the operation of a school district, but a policy position, however formal, is advisable because the adopted position will affect long-term goals. The school board might ask itself the following questions regarding computers and their use:

1. To what extent does the board wish computers to be used for Computer Assisted Instruction?
2. To what extent does the board wish computers to be used for Computer Managed Instruction?
3. To what extent does the board wish its students to be computer literate?
4. At which grade levels should computers be introduced?
5. To what extent does the board wish to use computers as word processors?
6. To what extent does the board wish to use computers in the administration of schools and/or central office?
7. Are schools permitted to use school raised funds to purchase computers?
8. Will only one type of computer be used within the system?
9. Will all computers be purchased by central office and loaned to schools?
10. Will all software be purchased centrally and then distributed to schools?
11. Will schools purchase their own software from school-based accounts?

The answers given to the first four questions will most definitely affect the type and amount of computer hardware and software a school system will require in order to achieve its goal. If, for example, a school system adopts a policy to support only computer literacy, the hardware requirements would be less costly due to a reduced demand for expensive peripheral devices and larger Random Access Memories. The capital costs to a board can vary greatly depending upon the answers given to these questions.

Questions 5 and 6 deal with the scope of computer use in school districts outside of classrooms. These questions must be answered because important hardware decisions will be facilitated through the process. If a computer is to be used for data management, careful consideration must be given to the size of the usable memory and data storage devices. In the case of word processing, student use (other than business education students) does not require sophisticated software or printers but administrative uses usually require letter quality printers and more extensive software packages. Other administrative uses such as recording student history, attendance, scheduling and mark reporting should be considered. Appropriate hardware and software for these uses must be provided if computers are to be used for any or all of these functions.

The remaining questions deal with the extent to which there is to be central coordination and control over program implementation. It is important that these issues be addressed prior to introducing computers into the school system in order to develop strategies for the inservice of teachers, efficient use of computer software, school autonomy and individual initiative.

Central Coordination. Central coordination of the implementation process was one of the noticeable features observed in the systems visited (Chapter 3). Central coordination can minimize the purchase of poor software, coordinate the inservice component and manage the allocation of hardware in the respective systems. Part of the coordination function is to provide leadership for the attainment of system goals within the scope of established policies of the board.

Computer Implementation Committees. One strategy designed to facilitate the implementation process is the establishment of a committee, with representation from each school, which will assist the school system in introducing computers into the schools. This committee can provide system-wide input into goal identification, hardware and software purchase, and decisions regarding the use of computers as tools in the educational process. Individuals serving on the committee will gain the potential to train other teachers at the school level and direct the application of computers toward educational objectives.

Implementation Constraints

A number of factors will impinge on a school district's plans for implementation of microcomputer technology in its schools. The following factors must be considered when making decisions:

1. The level of expertise of the teaching staff expected to use computers,
2. The financial position of the school district,
3. The decreasing cost of computer hardware,
4. Growing public awareness of computers,
5. Students needs and
6. Alberta Education's plans regarding computer literacy courses and other computer-related programs.

The above list, although not exhaustive, highlights some very important constraints within which educational decisions must be made.

Summary

Implementing computer technology into the school system involves building expertise among staff and using this expertise to expand the application of computers in the educational process.

The school board's crucial role in this process should include consideration of:

1. Establishing system goals and priorities,
2. Providing opportunity for staff development, and
3. Matching hardware and software purchasing to the level of readiness within the system.

This chapter raises several questions that must be addressed in developing a computer technology implementation plan.

CHAPTER 6

IMPLEMENTING COMPUTER TECHNOLOGY IN COUNTY OF GRANDE PRAIRIE SCHOOLS: A DISCUSSION OF STRATEGIES

Introduction

The purpose of the previous chapter was to develop a model for implementing computer technology in school systems. In this chapter, the model is used as a framework for developing strategies to implement computer technology in the schools of the County of Grande Prairie.

Specifically, discussion will focus on:

1. Constraints within which the County of Grande Prairie must function,
2. Identification of system priorities,
3. Establishment of system goals and policies,
4. Project coordination,
5. Inservice education requirements,
6. Computer hardware purchase and placement,
7. Software purchase, and
8. A plan for the evaluation of the implementation process.

Constraints

Two major sets of variables affecting the introduction of computer technology in the schools of the County of Grande Prairie are:

1. The generally low level of expertise among county staff, and
2. Financial constraints in a time of restricted money supply.

Counterbalancing these constraints are the following pressures:

1. Growing public awareness of the importance of computer technology to society,
2. The rapidly decreasing cost of microcomputer technology,
3. The need to equip students with the skills required to become fully functioning adults in society, and

4. Alberta Education's introduction of computer literacy courses in both elementary and secondary schools.

The pressure to use computer technology in the teaching process is far greater than with many previous technologies, for in this case educators have not been the major change agents. Microcomputers have become a consumer item and are appearing in the home more frequently than in the school. The impact of microcomputer technology on society is such that many now view computer literacy as one of the "basics".

School systems can not ignore computer technology as a legitimate part of the school program. A planned, coordinated program for implementation would be an asset to any system.

Priorities

In planning for the implementation of computer technology, some consideration must be given to the types of activities that will be undertaken in schools, both formally, through recognized curriculum, and informally through use of Computer Assisted Instruction and Computer Managed Instruction packages.

TABLE 6.1 summarizes possible uses of computer technology and indicates the priority each may have when considered in light of the County of Grande Prairie situation. (Division I refers to grades 1, 2, and 3; Division II includes grades 4, 5, and 6; Division III includes grades 7, 8, and 9; and Division IV includes grades 10, 11, and 12).

Computer Literacy. Research indicates that the primary emphasis, at least in the initial stages, should be on the

TABLE 6.1

Priority of Uses of Computer Technology For the County of Grande Prairie

Use	Division	Priority	Recommended Implementation
Computer Literacy Curriculum	II III IV	High	Sept. 83 - Feb 84
General Computer Awareness	I	High	Feb. 84 - Sept. 84
Computer Assisted Instruction	I II	Moderate	Feb. 84
Computer Managed Instruction	II III	Moderate	Feb. 84 - Sept. 84
Computer Assisted Instruction in Special Education	I II III	High	Feb. 84
Computer Science Sources	III	Moderate	Sept. 84 - Feb. 85
	IV	High	Sept. 83 - Feb. 84
Business Education Applications	IV	High	Already Implemented
Industrial Education	III IV	Low	
School Administration	I II III IV	Low	

development of computer literacy among students. Alberta Education personnel have indicated that the elementary computer literacy program can be taught quite adequately with one or two computers per school. Since later courses at the junior and senior high schools involve a greater programming orientation, more computers will be necessary to allow for student access time. The effective use of one or two computers at the elementary level was demonstrated during visits to other school districts. In Sangudo Elementary School, a very active school resource teacher had established a highly effective awareness and literacy program based around an activity centre in the school's library.

General Computer Awareness. Primary students should also be introduced to computers. Although no formal courses will likely be available for students in grades 1, 2, and 3, some computer software programs are available which relate to the curriculum for these grades. As a result, students need to be aware of computers and become familiar with them.

Computer Assisted Instruction. At present, the availability of good quality computer programs is somewhat limited; however several major textbook publishers are now beginning to produce software that correlates to texts authorized for use in Alberta schools. These programs are primarily focusing on the elementary grades.

Computer Managed Instruction. Computer Managed Instruction models would work very well in a classroom environment in grades 4 to 9. Even with only one or two computers in a school, Computer Managed Instruction programs could be utilized effectively through the use of portable computer units, or a computer centre in some centralized location such as the school library. The visit to Sangudo Elementary School indicated that a library computer centre is an effective way to maximize student and staff access where there are a limited number of computers available.

Computer Assisted Instruction in Special Education. Computers have been used very effectively in teaching students with learning disabilities. The use of drill and practice programs and programs which contain curricular material over a wide range of grade levels can be very effective in helping the special education teacher develop individualized student learning packages. The positive motivational value of computers in special education has also been well researched. With the advent of speech synthesizers and other interactive hardware, many learning disabilities can be remediated.

Uses in Secondary Schools. Business education programs involving computers are already in place in Sexsmith and Beaverlodge high schools. Computer science courses are a high priority at the senior high levels and at a somewhat lower priority in the junior high school grades. Use of computers in industrial education is a low priority.

School Administration. The use of computers in school administration is of relatively low priority; however, possible uses should be explored as suitable software packages become available.

Major System Goal and Related Policies

In evaluating the pressures, constraints and priorities that impinge on the school system, it becomes necessary to establish a goal and some related policies which are consistent with these existing conditions. The policy statements can give guidance as to the depth and breadth of the use of computers and the nature of the implementation process.

System Goal. The Board of Education will initiate a program for the use of computers for instruction in the schools of the County of Grande Prairie.

Policy Statements. The following policy statements and the related discussions support the above goal. The policy statements are summarized in TABLE 6.2.

Policy Statement 1.

> The Board of Education supports the introduction of computers into the schools of the County through a centrally coordinated implementation program.

Discussion. Policy makers need to ask: "Should there be a coordinated system-wide approach to implementation or should local initiative and the ad hoc approach that has been prevalent in the province be encouraged?" The research clearly shows that centrally coordinated and planned programs are preferable.

Policy Statement 2.

> The Board of Education supports the concept of the availability of computer technology to instruction at all grade levels.

Discussion. Policy makers should consider the question: "Is computer technology to be restricted to certain groups of students or schools?" While there are more applications for computers at the senior grade levels, the suggestion of restricted access is neither acceptable in terms of equality of opportunity nor justifiable in terms of instructional suitability. If computer literacy is viewed as an essential skill for all students, then such literacy can be established at an early age. The majority of Computer Assisted Instruction applications that have been developed to date are geared towards elementary and junior high school levels. At the high school level, there has been a greater emphasis on computer programming courses and the use of computers in specialized areas of industrial and business education, where the emphasis is on application rather than literacy.

Policy Statement 3.

> The Board of Education supports the introduction of microcomputers into the existing resource room programs throughout the County.

Discussion. There is considerable evidence suggesting that the computer can act as a strong motivator. The literature on the use of the computer with students experiencing learning difficulties is fairly extensive. The use of computer technology with learning disabled students would greatly enhance the programs presently being offered.

Policy Statement 4.

> The Board of Education supports the development of a teacher inservice program.

Discussion. The analysis of the survey of county staff indicates that there are two distinct groups of teachers: those who are willing to take on leadership roles within the school and those who wish to develop their own literacy skills so that they might take advantage of computer technology in the classroom instructional program. Different inservice programs will be required for the two groups and probably differing levels of school board support. Suggested inservice programs are outlined later, but as a general principle, some form of inservice training will be required for most teachers if the implementation program is to be successful.

Policy Statement 5A.

> The Board of Education supports the development of student computer literacy.

Policy Statement 5B.

> The Board of Education supports the implementation of the Alberta Computer Literacy curriculum at the earliest opportunity.

Discussion. Presently, computer literacy has a fairly high priority because the level of computer literacy among students is fairly low. However, as microcomputers are introduced in the classrooms, many students will tend to become literate through exposure. There is much debate as to what constitutes an acceptable level of computer literacy. It is generally recognized that literacy should include a working knowledge of the BASIC computer language, as well as an understanding of the impact of computers upon society. Alberta Education has placed a high priority on the development of a computer literacy curriculum, which should be available to schools in the near future.

Policy Statement 6.

> The Board of Education supports and encourages the use of computers in classroom instruction.

Discussion. The use of computers as an instructional tool is very much dependent on the expertise of the teacher, the availability of suitable software and the availability of sufficient hardware. Alberta Education is currently evaluating software and recommending suitable programs for use with the Alberta curriculum. In addition, the Department has a provincial membership in the Minnesota Educational Computing Consortium project, and a considerable amount of useful Compuuter Assisted Instruction material is available to schools through that source. To fully implement Computer Assisted Instruction in every classroom in the county may be a desirable long term goal, but until the level of teacher expertise increases and sufficient hardware is made available, large-scale implementation is probably impractical. However, where specific applications are available, and teacher expertise and sufficient hardware are present, the use of Computer Assisted Instruction software should be encouraged.

Policy Statement 7.

> The Board of Education supports and encourages the use of computers for the management of student classroom instruction.

Discussion. Computer Managed Instruction is one of the uses for computers that has been suggested as appropriate for the classroom. Unlike Computer Assisted Instruction, in which the material to be mastered is presented to the student by the computer and there is some instructional interaction with the computer, Computer Managed Instruction is a method by which the teacher can monitor the progress, maintain records, and suggest strategies for learning. The instruction is still in the hands of the teacher, but the computer does much more of the monitoring function.

One experiment being conducted by the County of Wheatland has demonstrated the effectiveness of this model at the elementary school level. In multigraded classes there would be some significant advantages to the use of Computer Managed Instruction. As split grades are prevalent in the smaller schools in the county, the use of computers to aid in the management of instruction carries considerable merit.

A disadvantage of the system at present is that most Computer Managed Instructional software is specific to American resource material. In the County of Wheatland experiment, however, the software manufacturers customized the referencing material to match the resources recommended for use in Alberta.

Policy Statement 8.

> The Board of Education supports the computer applications presently in place and their continued development.

Discussion. Several computer applications are presently used in schools in the County of Grande Prairie, particularly at the senior high school level. The use of word processing technology in the business education program is well advanced. Other applications pertain to the accounting and industrial education programs. Although neither of the high schools is offering courses in computer programming, there is a high demand for such courses and the teacher expertise to offer them is available.

Policy Statement 9.

> The first priority of the Board of Education is that computers be used for instructional purposes.

Discussion. One application of computer technology that has not received much emphasis is the use of computers in school administration. Some schools are taking advantage of the computers already in place to handle such functions as accounting and purchase order control. Numerous other applications are available. The question that must be addressed is one of priority. Should administrative applications be developed for use in all schools? Will such applications come at the expense of instructional applications? Clearly, with limited financial resources some priorities must be established. At this stage instructional concerns would appear to take precedence. However, administrative applications have their place and should be considered in the implementation program.

Policy Statement 10.

> The second priority of the Board of Education is to support the use of microcomputers in school administration.

Discussion. Some consideration might be given to the use of the County's centralized computer system, the MAI BASIC FOUR, for school administration use. This system is currently used for accounting control but the feasibility of using it for such functions as student records could be explored.

Several school administrative packages are also available for use with school-based microcomputers. These are primarily designed for secondary schools and include such features as attendance, student records, and timetable development.

Summary

Having established a goal and policies, the school system must develop implementation strategies geared to attaining them. Developing strategies involves examining the range of alternatives available and evaluating each in terms of how well it would meet the goals as well as financial implications.

The school system survey indicated that desirable strategies have already been tested and shown to be successful. The county staff survey shows that while there is a general lack of formal expertise, there is a very high interest level and desire among

TABLE 6.2

Summary of Policies Supportive of the Implementation of Computer Technology in the Schools of the County of Grande Prairie

1. The Board of Education supports the introduction of computers into the schools of the County through a centrally coordinated implementation program.

2. The Board of Education Supports the concept of the availability of computer technology for instruction at all grade levels.

3. The Board of Education supports the introduction of microcomputers into the existing resource room programs throughout the County.

4. The Board of Education supports the development of a teacher inservice program.

5A. The Board of Education supports the development of student computer literacy.

5B. The Board of Education supports the implementation of the Alberta Computer Literacy curriculum at the earliest opportunity.

6. The Board of Education supports and encourages the use of computers in classroom instruction.

7. The Board of Education supports and encourages the use of computers for the management of student classroom instruction.

8. The Board of Education supports the computer applications presently in place and their continued development.

9. The first priority of the Board of Education is that computers be used for instructional purposes.

10. The second priority of the Board of Education is to support the use of microcomputers in school administration.

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teachers to become involved in the use of computers in schools. The implementation strategies should reflect these findings.

Project Coordination

The research has pointed out the importance of central coordination to the success of the implementation process. TABLE 6.3 shows several ways in which this central coordination can be achieved. Following is a discussion of the various project coordination alternatives and their relative merits.

Coordination Alternatives. Four alternatives for project coordination are listed below.

1. Full-Time Coordinator. The appointment of a full time project coordinator carries with it several advantages. Such a person would be able to act as a system resource person, ensuring that the implementation process proceeded successfully. The incumbent would also be responsible for implementing the necessary inservice program. A project coordinator who had a thorough knowledge of curriculum at all levels would be able to aid teachers in introducing Computer Assisted Instruction packages and incorporating them into the existing curriculum. A fourth advantage could accrue to the County through the coordinator's involvement in computer education on a provincial level. The coordinator could act as a liaison person with other computer education interest groups.

If the County were to open a learning resources centre, the project coordinator could also become a learning resources coordinator.

The major disadvantage of this alternative is the cost of maintaining the position. For a two-year term beginning in August 1983, the cost would be $94,500 spread over three budgetary years (TABLE 6.3). This amount is fairly significant for a relatively small school system like the County. Although the advantages would be extensive, the cost factor is probably too great. A second disadvantage is uncertainty about the perception teachers would have of this position. Is the position merely the addition of one more central office line administrator? The coordinator's position should be viewed as a staff assignment rather than a direct line administrative position. However, there is a danger that the role could expand into other curricular areas, and take on some line responsibilities if not clearly defined. In a time of fiscal restraint and staff reduction there is a possibility that the appointment of a full-time coordinator might cause resentment among teachers and have negative effects upon the implementation process.

2. Part-Time Cordinator (Half-Time Assignment). Alternatives 2 and 3 were developed in an attempt to gain the advantages of central coordination and at the same time alleviate the two major concerns about a full-time position. Under proposal 2, a coordinator would be appointed as a regular teacher or school administrator with duties split evenly between the regular teaching function, and the implementation function. This approach would maintain the advantages outlined in the previous section and significantly reduce the cost factor. The position would cost $50,000 over the three budgetary years (TABLES 6.3).

As the part-time coordinator would clearly be a staff person, the tendency for the role to expand and become identified too closely with line administration would be greatly reduced. Also the half-time designation is probably more suitable to the workload that will be required of the coordinator. Utilization of staff persons in this manner was introduced into the Social Studies Inservice project in 1981. Two teachers were seconded for a semester to act as resource persons and help coordinate the curriculum implementation project. Staff perception of this arrangement was very favorable, and the alternative outlined here would probably be received just as favorably.

Stenographic services for this approach could probably be achieved through a small addition to the regular school stenographic services at the site where the coordinator is based.

3. Part-Time Coordinator (One-Quarter Time Assignment). This alternative is essentially the same as the half-time alternative but with the project coordination component reduced to one-quarter time. While there would be a further cost reduction, some of the liaison and curriculum implementation advantages mentioned in alternative 1 would be lost.

One factor to consider is that there is a flexible range of time assignments between the half and quarter-time positions, the maximum benefits coming with the half-time position and reduced benefits coming as the time allotment is reduced.

4. Coordination by Central Office Administration. One of the major advantages of this alternative is the cost factor. However, the authors feel that the reassignment of the responsibilities of a central office administrator has many disadvantages, not the least of which is the consideration that

TABLE 6.3

Central coordination of the Implementation Process: Alternatives and Cost Implication

Alternative	Salary Costs ($)			Support Cost ($)			
	1983*	1984	1985**	1983	1984	1985	Total
1. Full-Time Coordinator	16,667	40,000	23,333				
Stenographic ***	2,083	5,000	2,917				80,000
Travel							10,000
Conferences				250	750	500	1,500
Other costs				300	700		1,000
TOTAL							2,000
							94,500
2. Part-Time Coordinator (0.5)	8,334	20,000	11,666				
Stenographic ****	1,563	3,750	2,187				40,000
Travel							7,500
Conferences				250	750	500	1,500
Other Costs							
TOTAL							2,000
							50,000
3. Part-Time Coordinator (0.25)	4,167	10,000	5,833				
Stenographic *****	1,250	3,000	1,750				20,000
Travel							6,000
Other costs				125	375	250	1,500
TOTAL							1,000
							27,750
4. Central Office Administration	NO EXTRA COST						

* From August 1

** To July 31

*** Based on 1/3 time, Base Salary $15,000

**** Based on 1/4 time

***** Based on 1/5 time

the curriculum coordination and supervision responsibilities of the central office are already so extensive that adding a major component such as the computer technology implementation project would mean that some other function would be de-emphasized. If the computer implementation project were added in the area of teacher supervision or curriculum supervision, other already implemented programs would suffer.

Secondly, whereas county staff have some expertise in computer technology, some further training for the coordinator may be necessary. This would also be true for a central office administrator. The question must be asked: "Can the necessary time be diverted from other duties?"

As the county currently has only three central office administrators, major assignment changes such as adding the computer implementation project coordination would mean a loss of supervisory services in other curricular areas, which would be a detriment to the educational process.

Line of Authority. In the event that a part-time coordination position is adopted, clear lines of communication should be developed. In order to facilitate decision making, the project coordinator should report to either the Superintendent of Schools or his designate, for the portion of his position related to the project. The coordinator will be working in all county schools and will need decision making support on county-wide implementation issues. Although this support could be achieved through working directly with each school principal, greater efficiency and control would result from a central decision-making apparatus.

Inservice Requirements

The question of where the responsibility for teacher inservice lies has generated considerable debate in recent years. Is it the duty of the professional teacher to remain current in his field? Does government bear the responsibility to ensure that new curriculum is implemented successfully and thus, the responsibility to retrain teachers? Should Boards bear some of the burden by virtue of their mandate to provide a fully functioning educational system capable of quickly accommodating new strategies and technologies? Each of these questions is based on assumptions about the responsibilities shared by all parties in the delivery of instruction in the classroom.

A general model appears to have developed through the past few years of rapid curriculum change. Under this model teachers assume the responsibility to prepare themselves through the acquisition of formal education, school boards assume responsibility for sponsoring inservice activities as they reflect changes in the classroom curriculum, and the provincial agencies provide support services to both boards and teachers.

The inservice plan for the computer technology implementation project will require the designation of one staff member from each school to act as a school resource teacher. These resource teachers with the help of outside resource persons and hopefully a project coordinator will train the remaining staff members. School resource teachers will also be able to assist with the introduction of computer hardware and software into their schools.

Two levels of teachers' inservice activities, one for those designated as school resource teachers and one for all other staff, are outlined below.

School Resource Teachers. During the many visits to other school systems, the researchers were impressed by the role played by teachers who acted as key resource people within the school setting. Their contribution--their enthusiasm and willingness to work with other teachers--has been of prime importance to the success of programs visited.

The survey of county staff has indicated that there are such teachers within the county system; most schools have at least one teacher who is willing to take on this role. In those schools where there are no teachers willing to accept such a role, leadership could come from the project coordinator.

Inservice for School Resource Personnel. Resource teachers will require a more intensive grounding in microcomputer technology, whereas inservice training for the majority of teachers will be in the areas of general literacy and application.

It is important that resource teachers are able to handle equipment that will be used in the schools. Through contact with the project coordinator, they will be able to act as a pipeline, feeding information and resources to the classroom teacher. In addition, it is hoped that these teachers will be involved in teaching the various computer literacy and programming courses to be offered in the schools. Resource teachers should receive inservice training on the computer literacy materials and on software which will be available for them to use in schools. As the hardware proposals in this report would ensure that each school has at least one computer, a series of inservice days with periods of time in between to allow the teachers to work with the computers in the schools, would be preferable. The Medicine Hat experience showed how effective this approach can be.

Outside resource persons would be particularly valuable in exploring the software applications available to schools. Alberta Education is evaluating existing software, and inservice from that source could be a great benefit.

The province-wide school system survey indicated that little use was being made of industry resource people and that the majority of outside resource people were from Alberta Education and Alberta Educational Communications Corporation (ACCESS). An obvious advantage of using these resources in conjunction with local resources is the saving in cost.

By utilizing existing teacher inservice budgets, the additional cost to the board for computer inservice activities could be minimal. However, such days as the annual Fall Teachers Institute may not be timed conveniently. School resource teacher inservice sessions may have to take place before the 1983 Fall Institute if the resource teachers are to be active by September.

TABLE 6.4 indicates four different alternatives for training resource teachers. The inservice activities suggested each utilize four half-day units of time and require substitute

TABLE 6.4

School Resource Teacher Development Alternatives and Cost Implications

Alternative	Release Time Substitute Days*	Support Costs $	Total $
A. Four afternoons for 13 teachers conducted by project coordinator	2808		2808
B. Two afternoons and full day at Fall Institute (13 teachers) conducted by project coordinator	1404		1404
C. Full day and two afternoons using outside resource persons from Alberta Education (13 teachers)	2808		2808
D. Full day and two afternoons using outside resource persons (13 teachers)	2809	750 Resource Costs	3558

* Based on $108 per day substitute salary

teacher costs for from two half-days to four half-days for each of the 13 teachers, who represent all schools of the system.

Teacher Inservice Education

The survey of county staff indicated that interest in developing computer expertise is very high. The survey showed, however, that there are three groups of teachers, namely:

1. Those willing to act as school resource persons,
2. Those wishing to upgrade their knowledge and skills so as to better utilize the technology available for instruction, and
3. Those not wishing to become involved with the use of computers in schools.

Inservice alternatives for resource teachers have already been discussed. There are several alternatives available for the second and larger group, ranging from long-term activities sponsored and funded by the school board to teacher-sponsored activities with no school board funding. TABLE 6.5 outlines some of the strategies and their cost implications. Two alternatives for training all staff are presented, with costs of $1000 and $200 for the 1983 budget and $1500 and $300 for the 1984 budget. The $1000 and $1500 amounts include consultant fees for hiring outside resource persons, while the lower amounts utilize system resource persons.

Inservice for special education teachers is included in the 1984 budget as a high priority item at a cost of $2140.

Where teachers are to be formally engaged in implementing instructional programs such as computer literacy courses, financial support from the board of Education is of paramount

TABLE 6.5

General Teacher Inservice Strategies

Target Group	Strategy		1983	1984	1985
General Teaching Staff	Evening courses with outside resource persons	Salary Supplies	800	1200	
	-with system resource persons	Supplies	200	300	
Special Education Staff (8)	Two day inservice training after evening course	Substitute teachers		1840	
		Supplies		300	

importance. Thus the proposed inservice plans for the school resource teachers (TABLE 6.4), assumes that release time will be available.

For the larger group of teachers, who are not immediately involved in the implementation process but wish to upgrade their own knowledge and skills, a program similar to the one utilized by the Medicine Hat consortium could be considered. The Medicine Hat inservice program was sponsored by the member boards to the extent that the school boards provided computer facilities through one of the schools and paid for the cost of hiring resource persons from the Medicine Hat Community College. Teachers then took a 21 hour computer orientation course, usually one evening a week for seven weeks. The teachers' response to the program has been exceptional, and the general computer literacy of the teaching staff has improved tremendously. The consortium is currently evaluating its inservice model through a study partially supported by Alberta Education. One advantage of using a similar model in the County of Grande Prairie would therefore be to supply a second data set on the development of teacher attitudes and expertise changes through the inservice program.

Special education teachers who would be using the technology at an early stage in the implementation process could be given priority for early involvement in this inservice program, and later they could participate in a specific orientation to the type of software that would be available to them in their classrooms.

Inservice Centres. Because the county does not as yet operate a Central Media Centre, inservice activities would best be offered in schools where sufficient computers are available. The hardware distribution strategies would suggest that Hythe or Sexsmith (or both) could be used as inservice centres. Both schools are central to population concentrations within the county. At present, Sexsmith already has a computer laboratory operation utilizing a room that was designed for typing classes. No extra cost would be involved in providing the necessary power outlets and tables, as these are already in place. At Hythe some electrical installation costs may be involved in the development of a computer laboratory.

Inservice Resource Persons. The strategies outlined in the TABLE 6.3 and TABLE 6.5 suggest that inservice resource persons be brought in from agencies such as Alberta Educational Communications Corporation, Alberta Education or Grande Prairie Regional College. There would be some costs associated with the latter alternative. Using the expertise of the project coordinator is an alternative which also has some merit. However, if this position is only part-time the coordinator may not have sufficient time to provide the inservice function as well as coordinating.

Formal computing science courses could also be encouraged. For instance, Grande Prairie School District No. 2357 sponsored an Athabasca University course for interested city teachers. This plan could also be used in the County of Grande Prairie.

Alberta Education Communications Corporation has produced a computer education program on videotape, utilizing the expertise of Dr. Milton Petruk. This course has met with considerable success, but is designed for the more in-depth type of service.

The school board could offer to pay tuition fees for teachers taking university credit courses in computing science and related fields. However, this type of support is more normally covered by collective bargaining agreements.

Computer Hardware Purchase and Placement

Several factors affect hardware purchase and placement in the County of Grande Prairie: the constraints within which it must work; its priorities, goals and policies and the inservice requirements already discussed.

A factor to consider in developing hardware purchasing strategies is school size. The county has a considerable mixture of schools, both in size and grade level, ranging from small elementary and elementary/junior high schools to larger junior 600 students. It is fairly reasonable to assume therefore that a considerably greater investment in hardware will be required to meet computer literacy program requirements in Harry Balfour or Wembley schools than would be needed for Bezanson or Elmworth Schools.

Secondly, the greater range of applications at the senior high grade levels gives rise to a need for a larger number of computers than do initial applications at the elementary level.

Computer Hardware

In considering computer purchases, several factors warrant discussion.

Format. One of the most contentious issues in selecting hardware is the format or type of computer to be purchased. The current distribution of computers in the County of Grande Prairie is shown in TABLE 6.6; three formats are presently in use, although the Apple format predominates. Most of these purchases have come as a result of funds raised by students and other local groups.

The proliferation of microcomputer manufacturers and the rush to get a slice of the consumer market has led to an almost total lack of compatability between one make of computer and another. Operating systems vary tremendously and even the BASIC language has seen a profusion of dialects, each machine having its own and refusing steadfastly to use others. Several factors favor the use of the Apple format, not the least of which are the availability of software and Alberta Education's decision to support only this format.

Cost. Basically three categories of microcomputers are currently running under the "home" or "personal" computer banner and each is also competing in the educational market.

Computers in the first group are relatively inexpensive ($300 - $400) but come with small Random Access Memories (RAM), typically up to 16K Bytes, and no peripheral devices. Computers

TABLE 6.6

Present Computer Distribution in County Schools

School	Apple II+, IIe Bell and Howell	Commodore	Atari	Radio Shack
Beaverlodge Elementary	-	-	-	-
Beaverlodge Regional H.S.	1	-	-	-
Bezanson	-	-	-	-
Elmworth	-	-	-	-
Harry Balfour	1	-	1	-
Hythe Elementary	2	-	1	1
Hythe Regional J.H S	2	-	-	-
LaGlace	-	-	-	-
Sexsmith Elementary	1	-	1	-
Sexsmith Secondary	4	1	1	-
Teepee Creek	1	-	-	-
Valhalla	-	-	-	-
Wembley	3	-	-	-
Grandview Colony	-	-	-	-

like the Atari 400 and Commodore Vic 20 are very popular in the home market. However, to upgrade them to the level required by a lot of educational software, 48K RAM and disk storage, brings their price up to, and in some cases beyond, the second group.

More expensive than the popular home computers are systems such as the Apple, Commodore Pet, and Radio Shack Model II. These machines, however typically come with 48 or 64K RAM, disk storage and video monitors. The Apple format particularly is adaptable to a multitude of different roles. The Bell and Howell Edumond produced by Apple was sold through Alberta Education's School Book Branch but apparently is no longer available from that source. Systems for the Apple and Commodore computers are available which will allow a number of computers to access centrally located mass data storage devices such as hard disk drives. The use of such devices could result in some savings of capital expense in a computer laboratory situation.

The third type of microcomputer under consideration tends to be oriented to the small business environment. The Apple III, IBM and DEC computers are somewhat larger in memory than the second group and consequently they are somewhat more expensive. The use of these computers for administrative purposes in some of the larger schools is feasible, but for general classroom use they are probably larger than necessary and unduly expensive.

Maintenance and Service. Generally, microcomputers operate with little problem and have high reliability rates. Disk drives contain moving parts and consequently are more likely to cause problems. Currently, there are few differences among machines when it comes to reliability. However, at the present time the only machine with full service support in Grande Prairie is the Apple.

Proposed Use. There has been some suggestion that the Apple format is rather expensive for school use. If the primary focus is to be computer literacy then a cheaper machine could be used, thus allowing for the purchase of more computers. However, if there is to be a significant move towards Computer Assisted and Computer Managed Instruction, then these cheaper machines would need to be upgraded. The disadvantage of having more than one machine format is software compatibility.

Many Apple "look-a-likes" are coming into the market at considerably reduced prices. The machines are compatible with Apple software and operating systems. The question as to whether or not to purchase the copy rather than the genuine article must be addressed. Distribution of the "look-a-like" machines is still very limited, and since the companies producing them are small, they may be unable to give service support. In this case the old maxim, "Your get what you pay for", is probably true.

Hardware Purchasing Alternatives

Strategy 1. TABLE 6.7 outlines strategies for the purchase and distribution of hardware to accomplish the goals of: implementing computer literacy programs, universal access and special education support.

This strategy assumes that by September 1983 there will be a minimum of one computer in each school in the County. Proposed hardware purchases for January 1984 would give the larger elementary schools three computers for general literacy work and one computer for special education purposes. Larger junior high schools would have four computers for general use and one for special education. The two high schools would have seven

TABLE 6.7

Strategy 1. Purchase Plan for Limited Implementation of Computer Literacy Courses at Division II, III,IV Levels and Special Education

School	Present Apple Format Computers	Sept. 1983	Jan.* 1984	Cost ($2000 per unit) 1983	1984
Beaverlodge Elementary	-	1	3	2000	6000
Beaverlodge Regional H.S.	1	1	5	2000	10000
Bezanson	-	1	-	2000	-
Elmworth	-	1	-	2000	-
Harry Balfour	1	1	3	2000	6000
Hythe Elementary	2	1	1	2000	2000
Hythe Regional H.S.	2	1	2	2000	4000
LaGlace	-	1	-	2000	-
Sexsmith Elementary	1	1	2	2000	4000
Sexsmith Secondary	4	1	3	2000	6000
Teepee Creek	1	1	-	2000	-
Valhalla	-	1	-	2000	-
Wembley	3	1	1	2000	2000
Grandview Colony**	-	-	-	-	-
Total	15	13	20	26000	40000

* Additional computers are allocated to larger schools for general literacy courses, special education, and programming courses.

** Provision for the placement of a microcomputer in the Grandview Colony school would be subject to negotiations with the Colony leader computers each which could be used for literacy and programming courses. This type of distribution would be consistent with an emphasis on the computer literacy curriculum developed by Alberta Education. The senior high school business education program could also utilize the machines for word processing. Although one system visited by the researchers recommended two students per computer for high school programming courses, seven computers will allow for ratios of 3:1 or 4:1 for class loads of 21 to 28 pupils. Limited enrollment in high school computer-related courses should be considered during these initial stages.

Strategy 2. To further the goal of literacy, as well as reduce the pupil to computer ratio in junior high and senior high school programming courses, the purchasing plan outlined below has been developed (TABLE 6.8). This plan includes the purchase of dot matrix printers for the larger schools that do not have them and provisions for a group of computers to be handled as a central resource to augment the literacy program in smaller schools.

The five computers and two printers held centrally could be used initially for teacher inservice work and then in 1984 to augment the computer literacy program in smaller schools.

Strategy 3. The geography of the county is such that in two locations, Sexsmith and Hythe, two schools share the same site. Also, in Beaverlodge two schools are a short walking distance apart. This situation would allow for some joint use of facilities to enhance the programs offered, which would be very advantageous in the initial computer literacy phase and would

TABLE 6.8

Strategy 2. Purchase Plan with Consideration of Division III and IV Program Needs

School	Present Apple Format	Purchase Sept. 1983	Purchase Feb. 1984	Printers Present	Printers Proposed 1983	Printers Proposed 1984	Cost ($) 1983	Cost ($) 1984
Beaverlodge Elementary	-	1	3	-	1	-	2850	6000
Beaverlodge Regional H.S.	1	3	6	1	-	1	6000	12850
Bezanson	-	1	-	-	-	-	2000	-
Elmworth	-	1	-	-	-	-	2000	-
Harry Balfour	1	1	5	-	1	-	2850	10000
Hythe Elementary	2	1	1	-	1	-	2850	2000
Hythe Regional J.H.S.	2	1	4	-	1	-	2850	8000
LaGlace	-	1	-	-	-	-	2000	-
Sexsmith Elementary	1	1	2	-	1	-	2850	4000
Sexsmith Secondary	4	1	6	2	-	-	2000	12000
Teepee Creek	1	1	-	-	-	-	2000	-
Valhalla	-	1	-	-	-	-	2000	-
Wembley	3	1	3	-	1	-	2850	6000
Grandview Colony*	-	-	-	-	-	-	-	-
County (Central Resource)	-	5	-	-	-	-	11700	-
Total	15	20	30	3	8	1	46800	60850

* Provision for the placement of a microcomputer in the Grandview Colony school would be subject to negotiations with the Colony leader.

TABLE 6.9

Strategy 3. Proposed Computer Purchases Using Centralized Computer Labs

School	Present Apple Format	Purchase Sept. 1983	Purchase Feb. 1984	Printers Present	Printers Proposed 1983	Printers Proposed 1984	Cost ($) 1983	Cost ($) 1984
Beaverlodge Elementary	-	1	1	-	-	1	2000	2850
Beaverlodge Regional H.S.	1	3	6	1	-	1	6000	12850
Bezanson	-	1	-	-	-	-	2000	-
Elmworth	-	1	-	-	-	-	2000	-
Harry Balfour	1	1	5	-	1	-	2850	10000
Hythe Elementary	2	-	1	-	-	1	-	2850
Hythe Regional J.H.S.	2	3	6	-	1	-	6850	12000
LaGlace	-	1	-	-	-	-	-	-
Sexsmith Elementary	1	0	1	-	-	1	-	2850
Sexsmith Secondary	4	3	5	2	-	-	6000	10000
Teepee Creek	1	1	-	-	-	-	-	-
Valhalla	-	1	-	-	-	-	2000	-
Wembley	3	1	3	-	1	-	-	-
Grandview Colony*	-	-	-	-	-	-	-	-
County (Central Resource)	-	-	5	-	2	-	1700	10000
Total	15	16	30	3	4	4	51400	63400

* Provision for the placement of a microcomputer in the Grandview Colony school would be subject to negotiations with the Colony leader.

allow for better use of equipment. Computer laboratories could be housed in the secondary school in Sexsmith, in the high school in Beaverlodge, and in either school in Hythe. However, for this example the junior high school in Hythe has been identified as the one to be so equipped (TABLE 6.9). In addition, teacher inservice training could be conducted at each of these facilities.

However the use of computer laboratories may not be the preferred plan in all situations. While the laboratory situation is well suited to the secondary school situation, it is probably not a good model for the elementary school. If the emphasis is eventually to be on instructional uses of computers rather than on computer literacy, then laboratories for elementary schools are not recommended.

The cost of the first three strategies could be reduced if implementation of computers into the area of special education were delayed until 1985 or dropped as a priority goal. The net saving would be $12,000 for the 1984 school year. Special education classes could make use of computers that are already in the school for the literacy program. However, dropping special education as a priority is not recommended since this is one area where there could be dramatic benefits to students with learning disabilities. One teacher in Red Deer remarked "A computer in the classroom is like having a second teacher!"

Strategy 4. Some school systems are placing computers in schools on the basis of so many computers per 100 students or so many students per computer. These ratios can vary with the grade level. TABLE 6.10 outlines such a strategy and shows the costs if computers were to be placed at a minimum of 1 per 250 students in 1983 and at 1 per 100 elementary and junior high students and 3 per 100 senior high school students in 1984. Printers are included on the ratio of 1 per 5 computers.

This strategy is equitable on the basis of student distribution, but it suffers two major drawbacks. First, little consideration is given to individual school initiative. Schools that have shown initiative in acquiring computers are penalized in the early stages of the program, a time when they are more ready for program expansion than other schools because there will already be computer awareness within the school. Second, individual schools would determine whether or not to use computers for special education rather than face a central office decision.

The cost of the program could be reduced by eliminating the plan for the County to hold computers centrally.

Summary of Computer Purchase and Placement Plan. The cost estimates for all four strategies are based on a unit cost of $2000 for an Apple IIe with a disk drive and a black and white monitor. The Apple format is discussed because of Alberta Education's stated preference for it, the availability of service in the Grande Prairie area and the current predominance of the Apple format in the district.

Future Directions

Assuming that the recommendations of this study will be

TABLE 6.10

Strategy 4. Proposed Computer Purchases Using Computer to Student Ratio

School	Present Apple Format	Sept. 1983	Feb. 1984	Feb. 1985	Printers				Cost ($)		
					Present	1983	1984	1985	1983	1984	1985
Beaverlodge Elementary (350)	-	2	2	3	-	-	1	-	4000	4850	6000
Beaverlodge Regional H.S. (337)	1	1	4	3	1	-	1	-	2000	8850	6000
Bezanson (110)	-	1	-	1	-	-	-	-	2000	-	2000
Elmworth (98)	-	1	-	1	-	-	-	-	2000	-	2000
Harry Balfour (605)	1	1	4	6	-	-	1	1	2000	4850	12850
Hythe Elementary (175)	2	-	-	2	-	-	-	1	-	-	4850
Hythe Regional J.H.S. (247)	2	-	1	2	-	-	1	-	-	2850	4000
LaGlace (124)	-	1	-	1	-	-	-	-	2000	-	2000
Sexsmith Elementary (280)	1	-	2	3	-	-	1	-	-	4000	6000
Sexsmith Secondary (360)	4	-	4	2	2	-	-	-	-	8000	4000
Teepee Creek (93)	1	1	-	1	-	-	-	-	2000	-	2000
Valhalla (45)	-	1	-	-	-	-	-	-	2000	-	-
Wembley (403)	3	-	1	4	-	-	1	-	-	2850	8000
Grandview (16)*	-	-	-	-	-	-	-	-	-	-	-
County	-	5	-	-	-	2	-	-	11700	-	-
Totals	15	14	18	29	3	2	8	2	31500	362500	59700

* Provision for the placement of a microcomputer in the Grandview Colony school would be subject to negotiations with the Colony leader.

adopted (see Chapter 7), the next phase of implementing computer technology must be considered. After computer literacy the next stage is the use of the computer as a tool in the educational process. Two alternatives for that phase are presented here.

Strategies for Implementing Computers as Tools.

Strategy 1. The first strategy would be simply to increase the overall number of computers available to schools and make the computers more portable. The computers could then be moved from room to room as needed. The 1985 plan would involve the purchasing of computers for schools as outlined in TABLE 6.11. The cost per unit, whether built locally or obtained commercially, is approximately $200.

Strategy 2. TABLE 6.12 outlines a similar strategy with the addition of computers in larger schools to handle many of the administrative requirements. The proposed purchases are based on the distribution of hardware that would result from the adoption of the purchase plan described in TABLE 6.9 (page 103).

Summary of Future Directions. It is difficult to predict the situation in 1985. At this time, the purchase of portable computer stations is seen as an economical way to allow student access to computers on a scheduled basis within their class. This approach would facilitate the use of Computer Assisted Instruction and Computer Managed Instruction in classrooms.

Software

When school systems implement computer technology, one of the most frequently overlooked areas is software requirements,

TABLE 6.11

Purchasing Plan for 1985 Budget Year-Alternative 1

School	Existing As of Feb. 1984*	Proposed Purchases 1985 Computers	Proposed Purchases 1985 Mobile Carts	Cost ($) Computers	Cost ($) Carts
Beaverlodge Elementary	4	2	4	4000	400
Beaverlodge Regional H.S.	10	-	2	-	-
Bezanson	1	1	2	2000	200
Elmworth	1	1	2	2000	200
Harry Balfour	7	1	4	2000	200
Hythe Elementary	4	1	3	2000	100
Hythe Regional J.H.S.	7	-	4	-	300
LaGlace	1	1	2	2000	400
Sexsmith Elementary	4	2	4	4000	200
Sexsmith Secondary	11	-	2	-	400
Teepee Creek	1	1	2	2000	200
Valhalla	1	-	1	-	100
Wembley	7	-	4	-	400
Wembley Primary**	-	2	2	4000	200
Grandview Colony	-	-	-	-	-
Totals	59	12	38	24000	
County Redistribution				-10000	
Total	59	7	38	14000	3800

* The distribution of computers is based on the adoption of Strategy 2 (TABLE 6.8)

** The new primary school in Wembley should be on line by September 1984.

TABLE 6.12

Purchasing Plan for 1985 Budget Year-Alternative 2

School	Existing As of Feb. 1984*	Proposed Purchases Computer for Instruction	Admin	Mobile Carts	Costs ($) Computers	Carts
Beaverlodge Elementary	2	3	1	4	8000	400
Beaverlodge Regional H.S.	10	-	1***	2	4000	200
Bezanson	1	1	-	2	2000	200
Elmworth	1	1	-	2	2000	200
Harry Balfour	7	1	1***	4	6000	400
Hythe Elementary	3	2	-	4	6000	400
Hythe Regional J.H.S.	11	-	1****	4	-	400
LaGlace	1	1	-	2	2000	200
Sexsmith Elementary	2	3	1	4	8000	400
Sexsmith Secondary	11	-	1***	2	4000	200
Teepee Creek	1	1	-	2	2000	200
Valhalla	1	-	-	1	-	100
Wembley	7	-	1****	4	-	400
Wembley Primary**	-	2		2	4000	200
Grandview Colony	-	-		-	-	-
Totals	58	15	6	38	48000	3800
County Redistribution		-5			-10000	
Total	58	10	6	38	38000	3800

* The distribution of computers is based on the adoption of Strategy 3 (TABLE 6.8)

** The new primary school in Wembley

*** Recommended purchase of larger capacity machines at approximately $4,000 each

**** No extra purchase needed

availability, and most importantly, cost. Perhaps the largest single cost of a computer system is the development of the software to use on the system. Most teachers do not possess the skills necessary to produce good instructional video software, nor do they possess skills to produce computer software. As a result, schools and school systems must depend heavily on the purchase of commercially produced software.

Role of Alberta Education. Fortunately, Alberta Education is cognizant of the problems with software and has taken steps to offer some leadership in this area. Alberta Education's computer technology project has as one of its components a Software Clearing House, which is charged with the evaluation of instructional software. It is assumed that plans are also in place for Alberta Education to set up a software distribution system similar to that which exists through Alberta Educational Communications Corporation for the distribution of video software. Without the Alberta Educational Communications Corporation's video dubbing service, it is doubtful whether smaller school systems would have been able to obtain the amount of video material currently available, and therefore doubtful whether or not television, as an instructional medium, would have been so successfully incorporated into the everyday classroom instructional arena.

Plans are already in place to distribute software produced by the Minnesota Educational Computing Consortium, and it is hoped that similar arrangements will be made for the purchase of distribution licenses for other commercial software. However, it is unlikely that all the software requirements for a school system will be available through provincial resources, and some purchasing of commercial software will be necessary. This is more particularly a concern where the computer is being used for particular applications in secondary education. To date purchase of computer software has been left to the individual school, and with the exception of business education departments, very little has been purchased.

The computer literacy program requires the use of application-oriented programs, which will require simple word processing, spread sheet and data base programs, many of which are available at reasonable cost from commercial suppliers. Medicine Hat School District has developed a software package for computer literacy and general school use which consists of a sampling of instructional, data base, utility and word processing programs. This kit is relatively inexpensive and has proved very valuable to schools that are primarily at the literacy stage in the use of computers.

Computer Managed Instruction software is available and, as mentioned previously, can be customized to reference the recommended resources used in the Alberta curriculum. The software costs are considerable, but in the County of Wheatland experience the manufacturer's support for the software has been good. Costs are presently not available but this area should be explored further, with the possibility of introduction on an experimental basis in the 1984 school year.

Software Purchasing. for the present, a relatively low level of centralized funding could be assigned for central purchasing of software, until the Alberta Education Clearing House and Alberta Educational Communications Corporation distribution systems are fully functional. Purchase of the type of software required for the computer literacy component could perhaps be handled effectively through existing textbook purchasing accounts.

Once instructional and applications software becomes available through Alberta Education, purchasing should be handled through regular media purchasing arrangements such as school-based library budgets. In addition, textbook accounts could be augmented by $5000 in 1983 and $5000 in 1984 for the purchase of commercial software to be used in the Computer Literacy Program and the development of school software packages similar to those developed in Medicine Hat. These resources should be purchased and distributed under the supervision of the project coordinator.

For specific applications at the senior high level, schools could purchase software through existing school-based budgets.

Summary. Alberta Education is playing and will play an important role in screening software for authorization in schools. Schools currently have procedures for the purchase of textbooks and other instructional materials; consequently new procedures are not required for the purchase of software at this time.

Evaluation Plan

The implementation of computer technology in the County of Grande Prairie should be evaluated in a separate study.

The effectiveness of the implementation process could be assessed by measuring the attitudes towards computers of all teaching personnel and central office administrators. The current study indicates that the attitude towards computers is very positive. The staff is looking forward to the implementation of computers and becoming more knowledgeable. Secondly, the effectiveness of computer-related inservice activities should be a focus of the evaluation plan. As discussed in this study, a major aspect of the implementation plan is teacher inservice education. The evaluation should also address the establishment of goals and policies related to the implementation of computers.

These items are suggested for inclusion in the evaluation process because they are judged to be of vital importance in the overall implementation plan and should therefore be used as a basis for judging the effectiveness of the program.

Summary

Chapter 6 discusses strategies that could be used by the county of Grande Prairie when introducing computer technology in its schools. The strategies have taken into account the constraints within which the school system finds itself. A series of policies which could operationalize the goal of initiating a program for the use of computers for instruction in the schools of the system was also stated.

The necessity of coordinating the implementation project is discussed, and several alternatives for providing the coordination function are outlined.

Inservice requirements for school resource teachers and all remaining staff are outlined, along with alternative strategies for fulfilling these requirements.

A variety of alternative strategies for the purchase and placement of computer hardware in schools is presented, both for now and for the future.

Finally, the need for an evaluation component is noted and a descritpion of what should be evaluated is presented.

CHAPTER 7

SUMMARY AND RECOMMENDATIONS

This chapter provides a brief summary of the study's origins, purpose, method of collecting data, implementation strategy, and recommendations.

Origins of the Study

This study was developed at the request of the County of Grande Prairie No. 1 in April 1982. Since the county had not yet implemented computer technology in its schools and was facing rising pressure to do so, it requested that a coordinated plan be developed. As the County of Grande Prairie school system is fairly typical of many systems in the province, Planning Services of Alberta Education supported the project and requested that some general guidelines for implementing computer technology be developed.

Purpose of the Study

The two major purposes of the study were:

1. To develop a range of alternative plans for the introduction of computer technology into the schools of the County of Grande Prairie.
2. To develop a general model for the development of computer technology implementation strategies which would be applicable to any small school system.

Study Objectives. In attempting to fulfill the purposes of the study, the following objectives were established:

1. To assess the instructional uses of computers in schools.
2. To assess the non-instructional uses of computers in schools and school systems.
3. To explore computer implementation strategies employed by school systems.
4. To assess the technology available to a small school system.

5. To determine present knowledge and expertise among personnel in the County of Grande Prairie.
6. To determine the extent and availability of human and physical resources outside the County of Grande Prairie.
7. To analyze current implementation strategies in terms of their application to the county of Grande Prairie.
8. To develop alternative implementation strategies for use by small school systems.
9. To present the implications of each alternative with regard to physical and human resource needs.
10. To make recommendations as to the most suitable alternative for the County of Grande Prairie.
11. To produce a handbook of planning guidelines, for implementing computer technology in school systems, indicating do's and don't's.
12. To develop a plan for evaluating the effectiveness of the implementation of computer technology in the County of Grande Prairie schools.
13. To present a final report to the Board of Education not later than June 1983.

Data Collection

Several strategies were used to attempt to meet the study objectives. The researchers identified data sources and then develpoed two questionnaire surveys, one for Alberta school superintendents and the second for the County of Grande Prairie teaching staff.

The survey of Alberta school superintendents was intended to collect data on how school systems in the province of Alberta were coping with implementing computer technology in the schools. It was designed to gather information about:

a) school board policies concerning the implementation of computer technology in schools,
b) computer hardware and software distribution and usage, and
c) coordinating the implementation process and developing system expertise.

Of the 110 systems surveyed, 93 responded for an 85% return.

The survey questionnaire of County of Grande Prairie staff was intended:

a) to determine the level of expertise in the use of computers among county staff members, and
b) to determine the level of willingness of staff to become involved with the use of computers in the school.

The survey was distributed to all school-based professional staff. Of 187 surveys sent out, 155 were completed for an 85% return.

In addition the researchers visited six school systems in the province to examine their computer technology implementation strategies.

As a third strategy, review of the literature was conducted to gather information on computers and their use in schools and school systems.

Findings

The following major findings of the study are summarized below.

1. Survey of Alberta School Superintendents

   a) The extent of computer technology implementation in the province is rather limited. Little attention has been paid to the development of specific school board level policies in this area.
   b) In the distribution of computer hardware, the Apple format microcomputers have become a standard for use in Alberta schools, with some use of Commodore computers. Other formats are not present in significant numbers.
   c) Implementation of computer technology in schools has proceeded to a much greater extent at the senior high school level than at the elementary and junior high school levels.
   d) The major thrust of programs for the province is the development of computer literacy. Applications of computer technology are most advanced at the high school level, especially in the areas of business education and vocational education.

e) Where inservice programs have been developed, the tendency has been to utilize local resource leaders.
f) About 60% of the school systems responding indicated that they have central coordination of computer technology implementation programs.
g) Thirty percent of the respondents indicated that computers had not yet been introduced to schools in the system.

2. Survey of County of Grande Prairie Staff

a) The level of professional training of staff in the area of computer technology is low.
b) Interest among staff in the implementation of computer technology in classrooms is high.
c) Willingness to develop personal expertise in computer technology among staff is high.
d) One-fifth of the respondents indicated a willingness to take a leadership role in the school.
e) In general, secondary school teachers have a higher level of training and exposure to computer technology than do elementary teachers.
f) Approximately ten percent of respondents were identified as being possibly resistant to computer technology in schools.

3. School System Visits

a) An inservice program for teachers which is synchronized with the implementation of system hardware and software is important.
b) Central coordination is important to the success of the implementation process.
c) Those teachers within the school who have developed expertise and are willing to act as resource persons for that school play a key role.

Implementation Strategy Development

The study findings indicate that an effective implementation plan would have the following major features:

1. Clearly established system level goals,
2. A school board policy for the use of computers,
3. Provision for central coordination of the implementation process,
4. Provision for the development of expertise among the staff, coordinated with the plan for hardware and software purchasing and placement, and

5. Provision for the development of new uses for computer technology as the level of expertise among staff and computer literacy among students is developed.

On the basis of these features, many strategies for implementing computer technology were explored and those best suited to the needs of the County of Grande Prairie were identified.

Recommendations

Two classes of recommendations were made. The first set of recommendations are general statements applicable to many school systems, while the second set applies specifically to the County of Grande Prairie.

1. When implementing a computer plan into a school system, it is recommended that:
1.1. A school system adopt a set of goals for the use of computers in its schools.
1.2. A school system designate an individual to assume the coordination of the implementation process.
1.3. A school system provide for the centralized purchase and control of hardware in order to plan for the effective use of limited hardware during the initial phasing in of computers.
1.4. A school system provide for the centralized purchase and control of software for the system.
1.5. A school system establish an implementation committee with representation from each school in the jurisdiction.
1.6. A school system provide for teacher inservice activities related to the use of computers.
1.7. A school system encourage teachers to enroll in computer courses, and participate in inservice activities of interest to them.
1.8. A school system encourage teachers to use computers as a tool to assist them in reaching the goals of education.
1.9. A school system adopt a standard computer for use in the schools to ease the inservice requirements of implementation. Alternative models of computers could be purchased after the initial introduction of computers to schools.
2. For the implementation of microcomputers into the County of Grande Prairie, it is recommended that:

2.1. The Board of Education approve the following goal statement: "The Board of Education will initiate a program for the use of computers for instruction in the schools of the County of Grande Prairie."

2.2. The following table of priorities be adopted:

Uses of Computer Technology With Priority Rating and Implementation Schedule

Use	Division	Priority	Recommended Implementation
Computer Literacy Curriculum	II III IV	High	Sept. 83 - Feb. 84
General Computer Awareness	I	High	Feb. 84 - Sept. 84
Computer Assisted Instruction	I II	Moderate	Feb. 84
Computer Managed Instruction	II III	Moderate	Feb. 84 - Sept. 84
Computer Assisted Instruction in Special Education	I II III	High	Feb. 84
Computer Science Sources	III	Moderate	Sept. 84 - Feb. 85
	IV	High	Sept. 83 - Feb. 84
Business Education Applications	IV	High	Already Implemented
Industrial Education	III IV	Low	
School Administration	I II III IV	Low	

2.3 The Board of Education approve the following policy statements:

2.3.1. The Board of Education supports the introduction of computers into the schools of the County through a centrally coordinated implementation program.

2.3.2. The Board of Education supports the concept of the availability of computer technology to instruction at all grade levels.

2.3.3. The Board of Education supports the introduction of microcomputers into the existing resource room programs throughout the County.

2.3.4. The Board of Education supports the development of a teacher inservice program.

2.3.5.1. The Board of Education supports the development of student computer literacy.

2.3.5.2. The Board of Education supports the implementation of the Alberta Computer Literacy curriculum at the earliest opportunity.

2.3.6. The Board of Education supports and encourages the use of computers for the management of student classroom instruction.

2.3.7. The Board of Education supports the computer applications presently in place and their continued development.

2.3.8. The first priority of the Board of Education is that computers be used for instructional purposes.

2.3.9. The Board of Education supports the use of microcomputers in school administration.

2.4. The Board of Education hire a part-time coordinator for the computer implementation project.

2.5. The Board of Education create a committee of school resource teachers which has representation from each school and provide four half-day inservice sessions on computers early in September 1983.

2.6. The Board of Education offer computer literacy and computer processing courses in Sexsmith Secondary School during Semester I, 1983-84 and in Beaverlodge Regional High School in February 1984 or September 1984.

2.7. The Board of Education establish computer literacy courses for classroom teachers during the first half of the 1983-84 school year in the centers of Sexsmith and Hythe.

2.8. The Board of Education offer computer literacy courses in Divisions II and III during the 1983-84 school year.

2.9. The Board of Education pay tuition expenses for school resource teachers taking university credit courses in the area of microcomputers.

2.10. The Board of Education work toward the purchase and distribution of software through a centrally coordinated office. This could be a function of a media centre if one is contemplated in the future.

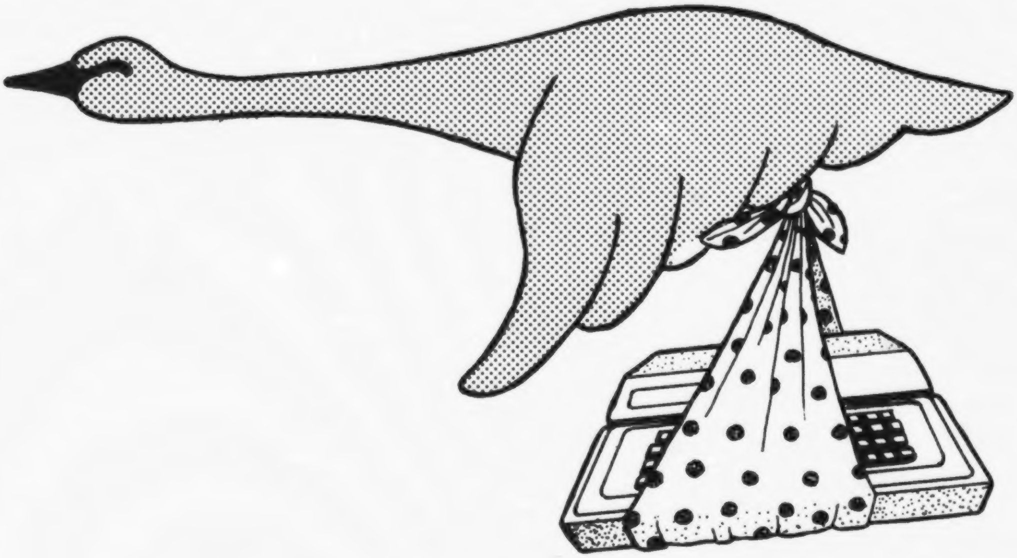
2.11. The Board of Education adopt a plan for the evaluation of the implementation of the microcomputer plan into the County of Grande Prairie.

2.12. The Board of Education purchase additional Apple II computers according to the following plan:

Purchase Plan

	Computers			Printers				
School	Present Apple Format	Purchase Sept. 1983	Feb. 1984	Present	Proposed 1983	1984	Cost ($) 1983	1984
Beaverlodge Elementary	-	1	3	-	1	-	2850	6000
Beaverlodge Regional H.S.	1	3	6	1	-	1	6000	12850
Bezanson	-	1	-	-	-	-	2000	-
Elmworth	-	1	-	-	-	-	2000	-
Harry Balfour	1	1	5	-	1	-	2850	10000
Hythe Elementary	2	1	1	-	1	-	2850	2000
Hythe Regional J.H.S.	2	1	4	-	1	-	2850	8000
LaGlace	-	1	-	-	-	-	2000	-
Sexsmith Elementary	1	1	2	-	1	-	2850	4000
Sexsmith Secondary	4	1	6	2	-	-	2000	12000
Teepee Creek	1	1	-	-	-	-	2000	-
Valhalla	-	1	-	-	-	-	2000	-
Wembley	3	1	3	-	1	-	2850	6000
Grandview Colony*	-	-	-	-	-	-	-	-
County (Central Resource)	-	5	-	-	-	-	11700	-
Total	15	20	30	3	6	1	46800	60850

* Provision for the placement of a microcomputer in the Grandview Colony school would be subject to negotiations with the Colony leader.



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APPENDIX A

Questionnaire Distributed to Alberta Superintendents

COUNTY OF GRANDE PRAIRIE No. 1
OFFICE OF SUPERINTENDENT OF SCHOOLS
8611 - 108 STREET
GRANDE PRAIRIE, ALBERTA T8V 4C5
TELEPHONE: 532-9722

November 1982

Dear Superintendent:

This survey instrument is seeking information about the methods school systems have employed to introduce computer technology into schools.

The project is specifically aimed at the development of strategies for the implementation of computer technology into school systems, and is being jointly funded by the County of Grande Prairie No. 1 and Alberta Education, Planning and Research Branch. We are particularly interested in obtaining information on your experiences with implementing computer technology into the school system and any of the problems that you have encountered.

It would be greatly appreciated if you or your designate could complete this questionnaire and return it to us in the enclosed stamped addressed envelope as soon as possible. The results of the survey, as well as the final report itself will be distributed to all school districts upon request.

Yours sincerely,

Hugh Sanders

Richard Gilchrist, Principal
County of Grande Prairie No. 1

Hugh Sanders, Math Consultant
Alberta Education, Grande Prairie

RG/rms

1. Does your school district have a board policy regarding the use of computers in schools.

No	Yes
If no, please proceed to the next question.	If yes, please attach a copy of the policy to the survey and return it with this questionnaire.
	In the space provided below, please indicate what changes (if any) you would recommend in the above policy.

____

____

____

____

____

SECTION A: HARDWARE

The purpose of this section is to gain some indication of the range of computing devices available in your system for school use.

Please check the appropriate responses.

2. All schools in the system have at least one computer in operation:
   - a) Yes ________
   - b) No ________

3. The average number of computers the elementary schools in the system tend to have is:
   - a) Five or more computers per school ______
   - b) More than two but less than five per school ______
   - c) Two per school ______
   - d) one per school ______
   - e) as yet computers have not been introduced at this level ______

4. The average number of computers the junior high schools in the system tend to have is:

   a) Five or more computers per school ______
   b) More than two but less than five per school ______
   c) Two per school ______
   d) One per school ______
   e) as yet computers have not been introduced at this level ______

5. The average number of computers the senior high schools in the system tend to have is:

   a) Five or more computers per school ______
   b) More than two but less than five per school ______
   c) Two per school ______
   d) One per school ______
   e) as yet computers have not been introduced at this level ______

6. The make of computers most frequently purchased is

   a) Bell and Howell ______
   b) Apple ______
   c) Radio Shack ______
   d) Atari ______
   e) Commodore ______
   f) other (please specify)

   ____________________ ______

7. Please indicate which peripheral devices are available to schools in your system (check appropriate columns)

	Elementary	Jr. High	Sr. High
a) single floppy disk drives	______	______	______
b) dual floppy disk drives	______	______	______
c) hard disk storage devices	______	______	______
d) dot/matrix printer	______	______	______
e) letter quality impact printer	______	______	______
f) communications modem	______	______	______
g) graphics input tablet	______	______	______
h) music synthesizer	______	______	______
i) other (please specify)			
____________________	______	______	______

8. Does your system have access to a centralized computer?
   a) Yes ________
   b) No ________

9. If you answered yes to question 8, please indicate make and memory size.

____

10. If you answered yes to question 8, please check the appropriate responses.

	Yes	No
a) Schools in the system have access to the central computer for administrative purposes	___	___
b) Schools in the system have access to the central computer for instructional purposes	___	___

11. The purchase of computer hardware is handled through; (please check appropriate responses)

a) Centrally administered budgets	___	___
b) Individual school based budgets	___	___
c) Cost sharing between central and decentralized budgets	___	___
d) Other (please specify)		

____

SECTION B: TEACHER IN-SERVICE

The purpose of this section is to determine the extent to which school systems have developed teacher in-service programs.

For questions 1 - 6, please check the appropriate column.

	Yes	No
1. The system employs a coordinator for computer education.	___	___
2. A central office administrator has been assigned responsibility for computer education as part of his/her responsibilities.	___	___
3. Each school has a staff member who acts as a computer resource person	___	___
4. The system has sponsored in-service activities for:		
a) All teachers in the system	___	___
b) Selected teachers from each grade level	___	___
c) Selected teachers from each school	___	___

	Yes	No
5. System sponsored in-service activities have been conducted:		
a) during school operational time		
b) in the evenings or at weekends		

6. In conducting in-service in the educational use of computers, the system has employed outside resource persons from:

	Yes	No
a) Other provinces		
b) Alberta Universities		
c) The Department of Education		
d) Access		
e) The computer manufacturing and distribution industry		
f) Other local experts in the field		

7. To what extent do you feel that the system sponsored in-service activities have resulted in the following.

Please use the following scale:
1 = not noticeable
2 = some increased activity
3 = considerable increased activity

	1	2	3
a) an increase in the awareness of computers amongst school staffs			
b) an increase in requests for further in-service			
c) an increase in the use of computers for instruction in the class room at the elementary level			
d) an increase in the use of computers at the junior high level	✓		
e) an increase in the use of computers at the senior high level			
f) an increase in requests for hardware purchases			
g) an increase in requests for software purchases			
h) an increase in the use of computers in school administration			

8. Please indicate the major thrust of your program at each level. In the second column indicate whether computers are used for any of the purposes listed.

a) Elementary	Major Thrust	Some Use
i) computer literacy		
ii) computer assisted instruction		
iii) school administration		
iv) no specific program emphasis		
v) other (please specify)		

____

b) Junior High School		
i) computer literacy		
ii) computing science		
iii) computer assisted instruction		
iv) guidance and testing		
v) school administration		
vi) no specific program emphasis		
vii) other (please specify) ______________________________		

c) Senior High School		
i) computer literacy		
ii) computing science		
iii) computer assisted instruction		
iv) guidance and testing		
v) school administration		
vi) business education		
vii) industrial education		
viii) no specific program emphasis		
ix) other (please specify)		

____

NAME OF SCHOOL DISTRICT, DIVISION OR COUNTY ______________________

NAME OF RESPONDENT ______________________

POSITION OF RESPONDENT ______________________

Please scan the questionnaire to see if you have inadvertently omitted any items.

We are extremely grateful for your cooperation.

Richard Gilchrist
Hugh Sanders

If you have any questions, please call collect:

Office: (403) 568-3642
Home: (403) 532-0026

APPENDIX B

Questionnaire Distributed to County Staff

COUNTY OF GRANDE PRAIRIE No. 1
OFFICE OF SUPERINTENDENT OF SCHOOLS
8611 - 108 STREET
GRANDE PRAIRIE, ALBERTA T8V 4C5
TELEPHONE: 532-9722

MEMORANDUM

To: ALL TEACHING STAFF

From: LAWRENCE BEAUDRY, Superintendent of Schools

Date: October 5, 1982

The County of Grande Prairie Board of Education has endorsed a study being conducted by Richard Gilchrist and Hugh Sanders entitled "Implementation of Computer Technology into School Systems." The purpose of the study is to develop and operationalize an implementation strategy for the use of computer technology in County Schools.

The attached questionnaire represents one of the instruments being utilized for data collection. In addition follow-up interviews with selected staff members will be conducted.

Your cooperation in completing the attached questionnaire and returning it promptly to Richard Gilchrist would be greatly appreciated.

Beaudry

LAWRENCE BEAUDRY
Superintendent of Schools

LB/hd

Enc.

COUNTY OF GRANDE PRAIRIE No. 1
OFFICE OF SUPERINTENDENT OF SCHOOLS
8611 - 108 STREET
GRANDE PRAIRIE, ALBERTA T8V 4C5
TELEPHONE: 532-9722

November, 1982

Dear Respondent:

The purpose of this survey is to assess the knowledge base, relative to computers, that exists among the staff of the County of Grande Prairie No. 1 School System.

The survey is designed in such a way that some respondents may not have to answer all of the questions, depending upon their past experiences. In any event, we would like to thank you for your cooperation in completing the survey.

All information given in this Questionnaire will be kept confidential and no individual will be identifiable in the final report.

Sincerely yours,

Hugh A. Sanders	Richard Gilchrist
Education Consultant (Mathematics)	Principal
Grande Prairie Regional Office	Sexsmith Secondary School
Alberta Education	

Instructions

After completing the survey please place it in the enclosed envelope and return it through the County Courier System to:

Hugh A. Sanders
Education Consultant
Grande Prairie Regional Office
Alberta Education
c/o County of Grande Prairie No. 1

COMPUTER TECHNOLOGY SURVEY

1. Have you had formal, University training in the use of computers that is acceptable to the Teachers Qualification Service for salary purposes?

☐ Yes ☐ No Please go to Question #2

If you answered yes to the above question please indicate the type of training you have in the spaces below:

COURSES IN COMPUTING SCIENCE ☐ No ☐ Yes

Course Number	University	Year

OTHER UNIVERSITY CREDIT COURSES ☐ No ☐ Yes

Course Number	University	Year

2. Have you participated in teacher inservice activities related to the use of computers in schools?

☐ Yes ☐ No Please go to Question #3

If you answered yes to the above question please indicate the type of inservice activity below.

A.T.A. convention sessions dealing with computers ☐ Yes ☑ No

A.T.A. specialist council convention sessions dealing with computers. ☐ Yes ☐ No

In school activities as a resource person ☐ Yes ☐ No

Please list all inservice activities, related to computers, that you have participated in.

Activity	Duration	Year

Please go to Question #3

3. Please indicate your response to each of the following by placing a check mark by YES or NO.

   a) If a computer were made available to you in your school, would you be interested in using it in your classroom? ☐ Yes ☐ No

   b) Do you feel you have enough knowledge about computers to enable you to use one in your classroom? ☐ Yes ☐ No

   c) Would you be willing to take university credit courses to upgrade your skills in using computers? ☐ Yes ☐ No

   d) Would you be interested in becoming a computer resource person within your school? ☐ Yes ☐ No

   e) Would you be willing to take part in a test to determine your knowledge of computers in education? ☐ Yes ☐ No

f) Would you be willing to assist in the development of instructional materials for use on computers? ☐ Yes ☐ No

g) Would you be willing to assist in the development of teacher inservice programs? ☐ Yes ☐ No

Please go to Question #4

4. For each statement indicated below, place a check mark in the box provided if the statement applies to you.

   - ☐ a) I have access to a micro-computer at school.
   - ☐ b) I am interested in participating in computer inservice activities sponsored by the school board.
   - ☐ c) I am interested in participating in computer inservice activities not sponsored by the school board.
   - ☐ d) I am willing to take University credit courses, related to the use of computers in education.
   - ☐ e) I own a microcomputer.
   - ☐ f) I have access to a microcomputer outside school.

5. Please add any comments about your involvement in the use of computers in Education.

____

____

____

____

____

____

******* Thank you for Filling in the Survey *******

****************PLEASE RETURN IT PROMPTLY****************